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[COMMITTEE PRINT]

OUTER SPACE—THE ROAD TO PEACE

OBSERVATIONS ON SCIENTIFIC MEETINGS AND INTERNATIONAL COOPERATION

A COMPILATION OF DATA

FOR THE

COMMITTEE ON SCIENCE AND ASTRONAUTICS

U.S. HOUSE OF REPRESENTATIVES

EIGHTY-SIXTH CONGRESS

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In Memoriam

This report is dedicated with deep sorrow and profound respect to the memory of our colleague

REPRESENTATIVE

DAVID McKEE HALL

May 16, 1918 – January 29, 1960

12th Congressional District, North Carolina

a member of the

House Science and Astronautics Committee

who, together with his colleagues of this committee, attended the London Conference of the International Astronautical Federation and visited various scientific and technical installations in Western European countries in the fall of 1959,

in tribute to his dauntless character, high moral principles, and indomitable courage in the face of life's adversities.

"It is in dying that we are born to eternal life."

LETTER OF TRANSMITTAL

FEBRUARY —, 1960.

Hon. OVERTON BROOKS,
Chairman, Committee on Science and Astronautics,
House of Representatives, Washington, D.C.

DEAR MR. CHAIRMAN: I am forwarding to you herewith for committee consideration a report entitled "Outer Space—The Road to Peace," with a subtitle "Observations on Scientific Meetings and International Cooperation."

This report is based on observations of committee members at the 10th Annual Congress of the International Astronautical Federation in London, England, and on my subsequent visits to several European countries in the fall of 1959.

Events during and after the period covered by this report emphasize the importance of greater international cooperation in the peaceful uses of outer space. The formation of the permanent United Nations Committee to deal with this subject and the approval by the United Nations General Assembly of a resolution to convene an international scientific conference on outer space make this report especially timely.

In the preparation of this report, I was assisted by the committee staff and by my executive assistant, Murray Frank. Abstracts of the technical papers presented at the IAF Congress were prepared with the aid of Prof. S. Fred Singer of the University of Maryland.

The conclusions and recommendations noted herein are respectfully called to your most careful attention for early consideration by the members of the committee.

Sincerely yours,

VICTOR L. ANFUSO,
Member of Congress.

LETTER OF TRANSMITTAL.

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OUTER SPACE—THE ROAD TO PEACE

INTRODUCTION

Recognizing the rapidly growing stake of the American people in science and, particularly, in space technology, several members of the House Committee on Science and Astronautics (mentioned below) traveled outside the United States in the fall of 1959 as observers at significant scientific meetings and in order to inspect certain key research laboratories on the European Continent. Chairman Overton Brooks of the Science and Astronautics Committee deserves a vote of thanks and sincere appreciation for his cooperation in enabling these members to undertake the observations abroad and their participation in these meetings.

This report is a summary of the activities thus undertaken and the observations made as a consequence. It is divided into the following sections:

Part I: A report on the 10th Annual Congress of the International Astronautical Federation, held in London, England, from August 31 through September 5, 1959. Committee members who attended the IAF Congress were Representatives Victor L. Anfuso, New York, senior member of the delegation; David M. Hall, North Carolina; William K. Van Pelt, Wisconsin; and A. D. Baumhart, Ohio.

Part II: A report of the activities and observations of Representative Victor L. Anfuso, New York, as a result of additional conferences with government officials and scientists in West Germany, Ireland, Denmark, and Italy. Included also are some views and proposals on international cooperation in outer space exploration for peaceful uses.

Part III: A report on United States-European collaboration on scientific research and development based on an inspection trip by Representatives David M. Hall and A. D. Baumhart, and a Navy science team headed by Vice Adm. John T. Hayward, Deputy Chief of Naval Operations for Development. They visited a number of scientific and defense research establishments in England, France, Belgium, the Netherlands, Norway, and Italy. Representative William K. Van Pelt accompanied this group for part of its itinerary.

The committee members are very grateful to Mr. Andrew G. Haley, former president of the International Astronautical Federation and now its general counsel, for his cooperation at the London Conference.

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OUTER SPACE—THE ROAD TO PEACE

INTRODUCTION

PART I. THE 10TH ANNUAL CONGRESS OF THE INTERNATIONAL ASTRONAUTICAL FEDERATION

SUMMARY

On the basis of the activities undertaken by the previously listed members of the House Science and Astronautics Committee and their observations at conferences and meetings with foreign scientists and government officials, as well as inspection trips to scientific establishments, some preliminary views are presented below in order to assist the committee in its future deliberations.

There was very little coordination, cooperation or interchange of information between the U.S. representation to the IAF meeting and officials of the American Government. In contrast, some delegations to the IAF, particularly those from Communist nations, appeared to work directly with and through their respective embassies in London. Committee members communicated directly with Dr. Leonid I. Sedov, of the U.S.S.R., the new IAF president, and his colleagues on a number of occasions and found it very difficult to secure any specific scientific facts concerning the Soviet space program. The reticence of the Soviet delegates seems to indicate that they have no decision-making power of their own, but depend on the Kremlin for guidance.

It appeared to members of the committee, after studying the way in which the IAF functions and its increasing potential as an instrument of international relations, that U.S. science teams might usefully coordinate their activities of an international nature with the State Department and with appropriate committees of the Congress of the United States. This kind of cooperation and coordination would reduce the risk of contributing valuable information to the Soviets and of getting little or nothing in return.

International cooperation and participation in such agencies as the International Astronautical Federation are not likely to make their maximum contribution to the national interest unless our delegations keep appropriate U.S. officials informed and seek their advice on matters of policy.

One difficulty, as committee members see it, is that Americans often start ventures of this type in an idealistic and moral vein—only to lose influence in the organization at the point where it becomes effective.

In summary, however, committee members wish to make it clear that—

(1) They believe the election of Professor Sedov to the presidency of the IAF may lead to increased cooperation with the Soviet Union and perhaps to an IAF meeting in Moscow by 1962.

(2) They are convinced of the high caliber and utility of the IAF as a continuing international scientific body.

(3) They recognize that the IAF is essentially a federation of private societies which would rightfully resent interference from national governments.

(4) They anticipate, nevertheless, that coordination between American delegates to the IAF and interested agencies of the legislative and executive branches of the Federal Government will lead to even more fruitful exchanges of information concerning the space sciences in future years.

The IAF Congress in London

The International Astronautical Federation (IAF) is composed of societies from more than 30 nations dedicated to the advancement of the space sciences.

The IAF is regarded primarily as a "private" organization. Its member societies are mainly nongovernmental—although there are a few exceptions, such as the Soviet society, which is a branch of the U.S.S.R. Academy of Sciences. Moreover, the IAF is not formally affiliated with any national government or with any international group composed of government representatives—although it has certain working relationships with the United Nations Educational, Social, and Cultural Organization.

The 1959 Congress of the IAF, held in London, was the 10th annual meeting in the history of the Federation and the second since the advent of the space age. It was the largest IAF meeting to date, attended by more than 650 scientists, representatives of industry and universities, government officials, and independent observers from 45 countries.

As the meeting opened, the astronautical societies affiliated with the IAF were: Agrupacion Astronautica Espanola, Spain; American Astronautical Society, U.S.A.; American Rocket Society, U.S.A.; Associazzioni Italiana Razzi, Italy; Astronautical Society of the Republic of China, Formosa; British Interplanetary Society, England; Canadian Astronautical Society, Canada; Canadian Astronautical Society (Institute of International Air Law), Canada; Dansk Interplanetarisk Selskab, Denmark; Deutsche Arbeitsgemeinschaft fur Raketentechnik, Germany; Deutsches Raketen und Raumfahrt Museum, Germany; Gesellschaft fur Weltraumforschung, Germany; Indian Astronautical Society, South India; Israel Astronautical Society, Israel; Japan Astronautical Society, Japan; Japan Rocket Society, Japan; Magyar Astronautikai Egyesulet, Hungary; Nederlandse Vereniging v. Ruimtevaart, Holland; Norsk Astronautisk Forening, Norway; Osterreichische Gesellschaft fur Weltraumforschung, Austria; Polskie Towarzystwo Astrontyczne, Poland; Schweizersche Astronautische Arbeitsgemeinschaft, Switzerland; Section d'Astronautique de Aeroclub-Sofia, Bulgaria; Sociedad Argentina Interplanetaria, Argentina; Sociedad Interplanetaria Chilena, Chile; Sociedade Interplanetaria Brasileira, Brazil; Society d'Astronautique de Grece, Greece; Societe Francaise d'Astronautique, France; South African Interplanetary Society, Union of South Africa; Svenska Interplanetariska Sallskepet, Sweden; U.S.S.R. Commission on Astronautics, U.S.S.R.; Yugoslav Astronautical Society, Yugoslavia.

During the course of the meeting, new voting member affiliates were admitted to the IAF from Belgium, Czechoslovakia, and India. The Aero-Space Medical Association of the United States, the Astronautical Society of Rome and two Portuguese astronautical societies were admitted as nonvoting members. An Iranian delegation received observer status.

It is important to note that IAF meetings are not limited to any single area of astronautics. There is no one overriding theme. On the contrary, almost all phases of the space spectrum as it exists today are covered during the meeting, including: research applications of satellites and space probes; projects for manned and unmanned space vehicles; methods of propulsion in space; problems in dynamics, control and navigation; reentry problems; biological, medical, and psychological aspects of space travel; legal, political, and social problems.

Moreover, while the widely divergent background of those attending the meetings of the IAF has certain drawbacks from a technical standpoint, it also tends to make the congresses an unparalleled marketplace for the exchange of ideas about space exploration.

1. INTERNATIONAL SIGNIFICANCE

As the only international organization devoted exclusively to space exploration and its problems, the IAF has achieved considerable status. No doubt its recent fame is due in part to the growing prominence of space in world affairs. The latter fact was implicit in the remarks made to the Tenth Congress by Dr. Hugh L. Dryden, deputy administrator of the National Aeronautics and Space Administration, and by the Right Honorable Aubrey Jones, British Minister of Supply.

Dr. Dryden spoke on the "Global Aspects of Space Exploration," pointing out that space exploration is likely to exceed the capabilities of any single nation and thus to require collaboration among many. Mr. Jones emphasized that space research is currently producing much international prestige for those engaged in it, with the effect of creating an unprecedented concentration of scientific talent, which in turn is accomplishing results at a much faster pace than was deemed possible only a few years ago.

An international flavor was similarly evident in the message sent to the IAF meeting by President Eisenhower, who stated in part:

> The opening of the space frontier presents a momentous challenge to all nations and peoples which can only be met by close and continuous cooperation. By meetings aimed at exchanging ideas and increasing the common store of knowledge of this great realm about which we need to know so much, you are helping to assure that the great discoveries which lie ahead will be harnessed to the benefit of all men everywhere * * *.

Further evidence of the international significance of the IAF meeting was the fact that several of the major powers had official representatives present as observers. The scope of national interest, in fact, shown in this meeting may have been unique. If so, it was nonetheless understandable for the reason, already mentioned, that the IAF is the only international society including Soviet and other bloc representatives for discussing all technical aspects of astronautics. Even though Soviet delegates have so far not been inclined to discuss the details of their space program, nor to publish much information not already known to Western scientists, the scarcity of other means of access to Soviet astronautics gives the IAF a special value.

At present, the only comparable international groups concerned with outer space are COSPAR—the Committee on Space Research of the International Council of Scientific Unions (ICSU)—and the permanent committee on outer space established in late 1959 by the United Nations. Both (especially COSPAR) are more limited in

scope and membership than the IAF. Neither has yet proved itself as a vehicle for Soviet participation, dissemination of information or space cooperation. For some time to come, therefore, the IAF is likely to remain uniquely useful as an international focal point for astronautics. Furthermore, in the future the United Nations may call upon the IAF for a variety of services.

This is not to say, however, that the 10th IAF Congress provided any real indication of the actual extent to which international cooperation in astronautics is possible at the present time. Neither is it to suggest that such collaboration should or could be effected through the IAF itself. That is a separate problem warranting further study.

2. IAF CONGRESS ACCOMPLISHMENTS

(*a*) *Technical papers*

A tabulation of the technical papers presented at the IAF Congress discloses a marked quantitative lead for the United States. Of the 72 leading papers presented at 18 technical sessions, the breakdown was as follows:

United States	42
Great Britain	6
France	5
Italy	4
Germany	3
Spain	2
Poland	2
Austria, Brazil, Bulgaria, China, Denmark, India, Sweden, U.S.S.R. (1 each)	8
Total	72

The subject matter of the papers may be generally categorized as follows:

Geometry and dynamics of orbits	16
Propulsion	13
Biological and psychological problems	12
Navigation and tracking	10
Physical environment and observation of methods	10
Reentry	7
Other	4
Total	72

While the number of papers is not a measure of the quality or quantity of any nation's actual work in astronautics, it may provide some evidence of the recognition by individual nations of the IAF as the leading international astronautical organization.

As indicated, delegates from both East and West took an active part in the presentation of scientific papers, though it should be noted that only 4 of the 72 leading papers were by delegates from Iron Curtain countries (Poland, 2; U.S.S.R. and Bulgaria, 1 each).

The Soviet papers were, as usual, distinguished by their uniformly good scientific quality. They had been given before, however, and were not original contributions. This same occurrence took place at the IAF meeting in Amsterdam last year. The other satellite countries presented new contributions.

It is apparent that the Soviet representatives do not consider the IAF congresses primarily as scientific meetings; otherwise, some of the papers would be specially written. Their attitude may be regarded as

realistic; since attendance at these congresses is heterogeneous, it makes little sense to present a highly specialized scientific paper if there are only one or two persons in the audience who can understand it. Papers on sputnik results, on cosmic rays, etc., are best presented to an audience of cosmic ray physicists and not to an astronautical audience.

Although the London congress was well organized, and an attempt was made to screen papers properly, many of the papers were only of cursory scientific interest.

By general agreement, the best papers on space physics and satellite results were presented by Western European authors. The paper by D. G. King-Hele of the Royal Aircraft Establishment, Farnborough, England, was concerned with the upper atmosphere densities as derived from the observation of 10 satellites, both American and Russian. It is held to be by far the best analysis of all satellite observations, better than any presented to date in either the Soviet Union or the United States. Similarly, the paper by H. K. Paetzold of the Max Planck Institute, Germany, on a similar subject, namely on density variations in the upper atmosphere, again derived from satellite observations, was of very high quality. Both authors point out that the density at high altitudes fluctuates with a 27-day component, which is identical to the 27-day rotation period of the sun. The correlations are unmistakable and point to a real solar influence on the density at very high levels. When this result is absorbed, one realizes that it makes little sense to speak about a "standard" atmosphere. Instead we must take into account that density variations are commonplace. Such density variations are, of course, of great importance with regard to reentry vehicles, particularly those which depend for their operation on accurately known atmospheric densities.

An outstanding piece of data which appeared in the paper by King-Hele, but which generally went unnoticed, was the fact that all three Soviet rocket carriers in orbit had about the same mass-to-area ratio. This suggests that the same vehicle may have been used to lift Sputniks I, II, and III, in spite of the great difference in weight of the three sputniks.

Another topic of great astronautical importance is the existence of radiation above the earth's atmosphere. Two major papers were presented on this topic. One by V. I. Krassovsky of the Soviet Union, the other by Prof. S. F. Singer of the University of Maryland.

Krassovsky, who is head of the Institute of Atmospheric Physics of the U.S.S.R. Academy of Sciences, presented this paper first in Moscow in July 1959. It is substantially the same result as reported last year in Amsterdam and still deals with the data obtained from Sputnik III in May 1958. However, the analysis has been carried somewhat further, and Krassovsky has the distinction of being able to identify for the first time the particles in the outer belt as low-energy electrons. These electrons do not have a great penetration range and therefore are of minor importance from a space-medical point of view. However, they are of great importance from a geophysical point of view, since they probably cause a large portion of the aurorae.

Dr. Singer's paper gave a review of our present knowledge of the radiation belts, both the inner belt and the outer belt. He confirmed Krassovsky's findings concerning the nature of particles in the outer belt and reported on Soviet experiments in Lunik I, which give addi-

tional evidence about the energy spectrum of these electrons. For the inner belt, Singer reported on the experiments by two California scientists who for the first time were able to analyze the nature and energy of the radiation of the inner belt. These experiments tend to confirm Singer's theory of the origin of this trapped radiation as coming from cosmic rays. Apparently the inner belt contains a large number of highly penetrating protons which may be of considerable space-medical significance for vehicles which remain in the inner belt for a long time. However, Singer concluded that a simple traversal of the belt in going out from the earth or coming back to the earth would not produce harmful effects. By far the greatest radiation danger to a space traveler, he believes, comes from the low-energy cosmic rays which are occasionally produced by the sun following a strong solar flare.

Among other papers presented which have basic astronautical interest were the following:

R. T. Haviland, of the General Electric Co., suggested a biological satellite to study problems of weightlessness and radiation exposure directly. He considered various designs for such satellites.

G. Partel and Antonio Angelone, of Rome, continued to discuss the possibility of rocket postal service. They have now made an economic study showing that payloads of about 200 pounds per vehicle are reasonable and that flight frequently should be at least one vehicle per hour for Paris to New York service. It should be noted, however, that their conception of rocket postal service may be superseded by postal service conducted by means of satellites.

Prof. E. Saenger, of Stuttgart, Germany, emphasized photon rockets and derived many interesting properties about them, most of which appeared to prove their impracticality, at least for the present.

H. B. Hutchinson and P. R. Arendt, of the U.S. Army Signal Corps Laboratory, Fort Monmouth, N.J., presented a paper on the variation of satellite signal intensity which they trace to the ionosphere. They noted that these variations were particularly intense following the three Argus high-altitude nuclear detonations.

D. D. Woodbridge and W. N. Arnquist, from the Redstone Arsenal, Huntsville, Ala., presented first results on the measurement of radiation from a reentering nose cone. Some excellent pictures were shown of the Jupiter reentry and some details were given about the analysis of the radiation into its spectral components.

M. E. Davies, of the Rand Corp., Santa Monica, Calif., gave a paper on lunar exploration by photography from a space vehicle. The subject is, of course, very topical because of the recent Russian success in this field. Rand has been giving considerable attention to the subject of photographic reconnaissance. The paper was well thought out. It showed that even a simple camera could obtain much better accuracy than the 200-inch telescope of Palomar from earth. In view of the poor definition of the first Russian pictures, one concludes that the Soviets have not reached the technical level which Mr. Davies described in his paper.

A paper by E. V. Stearns, of Lockheed Missile Division, considered the problem of interplanetary homing. A novel feature was the description of a loop system for adjustment of the orbit in midcourse. A similar problem was considered by R. J. Gunkel and others from the Douglas Aircraft Co. The latter paper was detailed and con-

sidered numerical examples of the types of transfer orbits which must be obtained in order to go to Mars or Venus. They utilized an impulsive correction of the trajectory in midcourse.

An unusual paper was presented by Dr. I. Schmidt, of Indiana University. She asked the question whether the green areas of Mars could not be green because of subjective visual impressions. She examined the problem from the point of view of visual physiology but did not reach a definite conclusion. Clearly, however, if the green areas of Mars are not really green, this will affect some of our thinking concerning the presence of vegetation on Mars.

Dr. D. R. Chapman, of the National Aeronautics and Space Administration Center, Moffat Field, Calif., presented a paper suggesting that in order to enter into a planetary atmosphere one must be at the right orbit. If too high, then too little drag will be experienced and the vehicle will leave the vicinity of the planet. If entry is too low, the vehicle will encounter too much deceleration to allow a human to occupy it.

Dr. F. R. Riddell and others of the AVCO Corp. presented for the first time their concept of a manned satellite which reenters by means of a drag brake. This paper was well received and produced an interesting discussion.

Nuclear rockets were the source of two papers, both by American authors. One discussion, concerned mainly with powerplants and missions, was given by J. J. Newgard and M. Levoy, of Reaction Motors. The other paper, which was concerned with the optimum flight path of a nuclear rocket, was discussed from a mathematical viewpoint by Prof. G. Leitmann, of the University of California.

Two Austrian scientists, Profs. W. Grobner and F. Cap, offered a mathematical approach to the so-called restricted three-body problem. This problem, which has never been solved in closed form, considers the motion of a small body in the gravitational field of two large bodies: for example, the problem of a spaceship moving in the gravitational field of Earth and Moon. It is not immediately evident whether the Austrian approach will lead to any appreciable simplification in the calculation of space orbits.

(*b*) *Space law colloquium*

Two sessions on space law were held at Lincoln's Inn. They were chaired jointly by IAF President Andrew G. Haley, Washington, D.C., attorney; C. N. Shawcross, London barrister; and John C. Cooper of Princeton, N.J., founder of the Institute of International Air Law at McGill University, Canada.

This was the second space law colloquium, the first having been held at Amsterdam in 1958. Some 25 papers were presented before lawyers, sociologists, and teachers from as many nations.

The first of these papers was given by a member of the House Science and Astronautics Committee, Representative Victor L. Anfuso of New York, who spoke on the subject, "Is Space the Way to Peace and Abundance?" The full text of his address is published in the appendix.

Briefly, Representative Anfuso stressed that the progress of space science and technology, as well as the peaceful uses of outer space, will be greatly facilitated by a full partnership of cooperating nations. Many projects in outer space, which could benefit all mankind, would

be impossible of realization without international cooperation. High costs will prevent any one nation from undertaking certain space projects, which can be done better and more economically if they are undertaken as joint enterprises by two or more nations.

Representative Anfuso proposed that all governments interested in the peaceful uses of outer space should create a Committee on Space Cooperation, providing fair representation for the Communist countries, within the framework of the United Nations. Its primary function would be the peaceful exploration and development of outer space in the common interest of all mankind. He warned that the denial of full and true participation in the peaceful exploits of outer space "would widen the no man's land barrier presently existing between the Western and Communist worlds and would invite further full-scale competition." He added that discoveries in space could easily be diverted, not to the creation of a world of peace and abundance for mankind, but to the creation of more menacing ways for the destruction of the world. He concluded with an expression of hope that space exploration will bring the peoples of the world closer together in new patterns of international cooperation.

Additional papers covered such topics as: "The Future of National Sovereignty" (S. M. Beresford, U.S.A.); "Solving the Space Sovereignty Problem" (H. T. Binet, Canada); "Effects of Special Developments Upon Contemporary Problems and Institutions" (B. Chazen, U.S.A.); "Territorial Claims to Celestial Bodies" (K. A. Finch, U.S.A.); "Limitations of the Freedom of Space" (E. Fonseca, Portugal); "Behavioral Sciences in the Space Age" (P. H. Furfey, U.S.A.); "The Report of the United Nations Committee on the Peaceful Uses of Outer Space: A Provisional Appraisal" (G. J. Feldman, U.S.A.); "The United Nations Ad Hoc Committee on Peaceful Uses of Outer Space: Implications for Legal Problems" (E. Galloway, U.S.A.); "Space Exploration—The Problems of Today, Tomorrow and in the Future" (Andrew G. Haley, U.S.A.); "Social Response in the United States to the Impact of Missile/Space Technology" (J. J. Hanrahan, U.S.A.); "Circle of Thoughts" (Welf Heinrich, Prince of Hanover, Germany); "Laws of Space and International Conventions" (R. Homburg, France); "Rules Regulating Earth-to-Earth, Space-to-Earth, and Earth-to-Space Interplanetary Vehicles" (R. A. Javitch, Canada); "United States and Soviet Viewpoints on Legal Problems of Outer Space" (S. Kucherov, U.S.A.); "Legal Status of Unmanned Space Vehicles" (J. Machowski, Poland); "Sociological Implications of Outer Space" (C. S. Mihanovich, St. Louis University); "Some Important Sociological Aspects of Problems of Space Law" (J. Nehnevajsa, India); "Proposals for the Future Work of the Permanent Legal Committee of the IAF" (E. Pepin, Canada); "A Survey of Space Law" (F. W. von Rauchhaupt, Germany); "How Shall Space Law Be Introduced" (J. Rivoire, France); "The Influence of Space Exploration on Mankind" (J. H. Rode-Verschoor, Netherlands); "The Role of IAF in Developing the Norms of Space Law" (M. S. Smirnoff, Yugoslavia); "The Law of Interplanetary Space" (H. Valladao, Argentina); "Functional Rules of Outer Space" (Modesto Vasques, Italy); "Space and Cognopolitics" (P. B. Yeager, U.S.A.).

3. IAF CONGRESS DEVELOPMENTS

The 10th Congress of the IAF resulted in a number of innovations adopted by the plenary sessions of the Federation. These included the following:

(1) Establishment of a preliminary committee to develop a functioning international Academy of Astronautics. The committee is being chaired by Dr. Theodore von Karman, U.S. science adviser to NATO. It will designate an initial membership in the Adademy, the locale for which is not yet determined, and the Academy will then begin its operations under the directorship of Dr. von Karman.

(2) Establishment of a four-member committee to develop a permanent IAF secretariat. This committee is chaired by the secretary of the British Interplanetary Society, L. J. Carter. Choice of locale for the secretariat has been narrowed to Paris, Geneva, and Rome.

(3) Establishment of an ad hoc committee to develop an International Institute of Space Law, within the IAF framework, which will supersede the present IAF Permanent Legal Committee. The ad hoc committee is headed by C. N. Shawcross of Great Britain.

The scientific publication of the IAF, Astronautica Acta, which was founded in 1953, was reorganized. The editorial staff now consists of Dr. Theodore von Karman, editor in chief; Academician L. I. Sedov and Dr. Frank J. Malina, coeditors. The editorial board consists of outstanding scientists from throughout the world. The Acta will be substantially expanded and scientific articles will be published hereafter in English, German, French, and Spanish. The reorganization of the Acta was one of the most important achievements of the IAF Congress.

4. ELECTION OF IAF OFFICERS

Especially significant was the election of officers at the IAF Congress for the year 1960. For the first time in its history, a Soviet citizen was elected president of the Federation. He is Prof. Leonid I. Sedov, chairman of the Commission for Astronautics of the Soviet Academy of Sciences. Professor Sedov was elected to the post unanimously, succeeding Andrew G. Haley of the United States.

IAF vice presidents elected were Col. John P. Stapp, USAF, who, as president of the American Rocket Society, headed the American delegation to the 10th Congress; A. Hjerstrand, of Sweden; L. P. Shepherd, chairman of the British Interplanetary Society; Eugen Saenger, of Germany; and Gen. P. J. Bergeron, of France. Mr. Haley was elected to the permanent post of IAF general counsel.

The election of Professor Sedov also marks the first time that a non-Western representative has held the office of president, although Sedov himself had been a vice president of the IAF since 1955. In the past the presidency has been held five times by representatives of the United States, three times by those of Germany, and once by a representative of Great Britain.

Because of the great importance of Soviet progress in astronautics and the past reluctance of the U.S.S.R. to participate in international meetings or groups devoted to space exploration, Professor Sedov's election has occasioned considerable comment and speculation. His remarks, upon his election to the IAF presidency are quoted in the appendix.

PART II. REPORT BY REPRESENTATIVE VICTOR L. ANFUSO ON HIS TOUR OF EUROPE

SUMMARY

Part II of this report deals primarily with my efforts to advance the cause of peace through international cooperation in outer space exploration and in the peaceful uses of outer space for the benefit of mankind. I prefer to call it "Crusade for Peace." I regard this approach as one of the most important and one of the most hopeful opportunities for all of mankind to attain better understanding and lasting peace.

I am strongly of the opinion that international cooperation in outer space should be established at the earliest possible date, especially between the two countries that have made the most significant advances in this field—the United States and the U.S.S.R. All of humanity stands to benefit immeasurably by such international cooperation, while the lack of it would contain the seeds of humanity's destruction at some future date.

The peoples of the world today fear the tremendous scientific power developed by the United States and the Soviet Union lest it be used for purposes of war, and at the same time they depend on these two nations for guidance and leadership in the new space age. Working separately and at cross-purposes, both nations would not only bankrupt each other economically and morally but, far worse, might ultimately bring total destruction upon themselves and the rest of mankind.

Working together in a spirit of cooperation, however, these two nations can help bring about a better and more abundant life for all peoples. Together, they can explore and exploit outer space for the benefit of mankind, so that no one on earth need ever be in want. Working in unison in this field, they can make a joint contribution to strengthen the permanent space committee of the United Nations and, eventually, bring all nations into a combined world program of outer space research and ultimate expansion toward other planets of the universe, guaranteeing an abundant life for all.

CONCLUSIONS

The following general conclusions are based on my observations during the trip abroad and the correspondence conducted, both of which are described and fully documented in this report:

(1) Expanded cooperation between the United States and foreign nations, both in astronautics and in related fields of research and education, would benefit the United States and the entire world.

(2) International cooperation would accelerate progress in space exploration by making available the vast resources, including personnel, information, ideas, installations and equipment, of all participating nations.

(3) Such cooperation would save billions of dollars for the United States and its partners in space research which could be diverted to education and raising the standard of living of all peoples of the world, provided it is undertaken as a joint or multilateral operation.

(4) It would prevent unnecessary waste and duplication of effort in scientific and space research.

(5) It would make possible an exchange program on a worldwide scale, attracting the best scientific brains and encouraging specialization in the field of outer space research.

(6) Better safety measures could be developed and applied for the benefit of all concerned, as a result of cooperative research activities.

(7) A limited form of international cooperation between the United States and the U.S.S.R. is not only possible but desirable in the national interest.

Recommendations

I should also like to make several specific recommendations for action:

(1) It is recommended that this committee continuously review and vigorously initiate measures for fostering such cooperation within the limits of American security interests. Appropriate measures for this purpose would seem to include support of, and participation in, international conferences, fairs and expositions, as well as scientific and astronautical activities of the United Nations and other international bodies; encouragement of specific space activities necessitating international cooperation or requiring it for maximum effectiveness, such as world space data centers and research institutes; and international exchanges of scientific and space personnel, including students on scholarships and fellowships, study teams, teachers, and research scientists.

(2) It is recommended that the United States establish joint science and economics teams, one for each country, to work in cooperation with similar teams in the respective countries. The teams would be comprised of experts in science, engineering, economics, and technological development, who are to work together in the field of operations, in studying ways to strengthen economically a particular country, in making it a working partner of the United States, and in strengthening the free world.

Carrying this proposal a step further, it might be desirable for the United States to set up a special agency as an adjunct of our foreign policy, perhaps to be known as Joint Economic Teams (JET), to conduct specialized joint international economic and scientific activities. For example, agreements could be entered into with nations desiring a partnership with the United States whereby we could help them solve their scientific and economic problems, explore their needs, exploit their resources for our mutual benefit, et cetera.

(3) It is recommended that more of our foreign aid be directed toward training free world youth in science, mathematics, engineering, and other technological studies, in order to match the growing strength of the Russians in education. This can be done through the establishment of schools abroad, providing scholarship for scientific study, bringing promising students to the United States for specialization, et cetera.

A. Observations and Comments on the Itinerary

Upon the termination of the International Astronautical Federation Congress in London, on September 5, 1959, where I had served as senior member of the U.S. congressional delegation, I left the next day on a personal tour of Europe.

For this task, I gathered a small group of able men whose assistance proved to be invaluable. With the exception of Capt. Winfred E. Berg, who was made available to me by the U.S. Navy, all the others made the trip at their own expense. Those who joined me on the trip were:

(1) Navy Captain Winfred E. Berg, experienced in scientific and astronautical research and development. He worked unceasingly during this trip, in spite of a sudden virus infection, and provided the technical knowledge I sorely needed. I am grateful to the Navy for his services and cooperation.

(2) Andrew G. Haley, former president of the International Astronautical Federation, a man of international fame who has a personal acquaintance with the foremost scientists of the world. He was the one who actually encouraged me to undertake this trip.

(3) Henry B. Owen, American Rocket Society, a practical and gentle person who knows a great deal about international communications; and

(4) Frank R. Cusumano, chairman of the board of the Bio-Ramo Drug Co., Baltimore, Md. Formerly a tenor with the San Carlo Opera Co., he broke the tension many times by his good nature and vibrant melodious voice.

Our itinerary was as follows:

September 6–8—Dublin, Ireland.
September 8–12—Copenhagen, Denmark.
September 22–24—West Germany, including West Berlin.
September 25–30—Italy.
October 1–3—Bad Godesberg, West Germany.
October 4–22—Italy.

Captain Berg joined our group in Copenhagen, stayed with us throughout the visit to West Germany and the Atlantic Bridge Conference at Bad Godesberg, and then returned to the United States.

1. IRELAND

Our visit to Ireland coincided with President Eisenhower's tour of Western European countries, notably West Germany, France, and England. Upon my arrival in Dublin, I quickly learned of the disappointment of public officials, as well as of the people, over President Eisenhower's visiting with the heads of several European governments but not with President De Valera of Ireland. I cabled the following message to President Eisenhower, who was then staying at Culzean Castle, Aberdeenshire, Scotland:

Arriving Ireland, learned it has only American-born head of State in all Europe. This great Republic, as well as 22 million Irish-Americans, will praise and thank you if you could just stop and shake hands with President De Valera at Dublin Airport. Please reply via American Embassy, Dublin.

(Signed) Congressman V. L. Anfuso.
Andrew G. Haley,
President, International Astronautical Federation.
Stuart Robertson,
Chairman, O'Connaught Castle, Ireland.

President Eisenhower replied that it was not possible for him to stop then in Ireland, as he was flying directly back to the United States. It is hoped that he will be able to make this stop when he returns to Europe to visit Premier Khrushchev of the U.S.S.R. in June 1960.

Scott McLeod, our Ambassador in Dublin, is doing a fine job there, and is trying to interest foreign business in opening plants in Ireland. The Irish Free State is offering (1) grants up to $140,000 to build a plant; (2) long-term, low-interest loans on any machinery or equipment; (3) training for employees at no cost to the investor; (4) 100 percent exemption from income tax and profits from export anywhere in Ireland up to 10 years and in Shannon area up to 25 years; and (5) no union trouble. Natural factories which could be opened up are (1) clothing, (2) brassieres, (3) drugs and chemicals.

I was received by the Lord Mayor of Dublin, the Honorable Philip A. Brady, with whom I had a pleasant chat.

Shortly before my departure from Ireland I was also received by President De Valera, with whom I discussed various world problems.

Because of the great interest on the part of the press and people of Ireland, I issued the following statement, which was featured widely by the Irish newspapers:

> In my opinion, discoveries in outer space, such as worldwide radio and television communication, regulation of the weather, and new forms of transportation, can create a world of abundance where no one need be in want—thus making war outmoded and unnecessary.
>
> I believe that my Government is ready to join any nation if peace and abundance be the goal; to go to the moon or any other planet in the cosmos together and raise not our flag but that of our world and say: "This we have done for the glory of God and all humanity."

2. DENMARK

Our stay in Denmark was limited to Copenhagen. My impressions here were that the people in general worry less than we do about the possibility of an atomic war. Their attitude is expressed in the remark heard often: "We can't do anything about it if it comes; we live only in hopes that America will get ahead of the Russians." Captain Petersen, who runs the ferry from Copenhagen to Sweden and who worked for the underground during World War II, told me: "Only the Americans can give us our freedom."

It was in Denmark, 3 days before the launching of Lunik II, that I issued a statement to the press containing the observation that if we were the first to reach the moon we would not claim it for ourselves but, on the contrary, for the entire world. Actually, I had made a similar statement in Ireland, but the Danish press picked up this particular remark and featured it under such titles as, "Will Hoist the Banner of the World on the Moon." The Russian press, likewise, carried this story.

In my statement, I expressed the hope that combined United States-Russian efforts and ingenuity in scientific research may lead to a more peaceful world. I voiced deep concern for the small nations in the event of a nuclear conflict, and emphasized that their only hope for survival is the creation of an international committee on space cooperation for the peaceful exploration of outer space in the interest of all mankind (which I had proposed at the IAF Congress

in London) as well as improved relations between the United States and the U.S.S.R.

From the Danish newspaper *Politiken* of September 9, 1959, I quote the following remarks attributed to me in a news story under the title cited above:

> * * * even if the United States is the world's strongest nation, it does not want to make any territorial conquests. We want peace, and if that is to be achieved we think it is necessary that all nations work together in the exploration of space on a peaceful basis. The world must know that it means the total destruction of the Earth if space research is utilized for hostile purposes. That is why we must have the cooperation of the Soviet Union, which has already taken a gigantic step into the ionosphere.
>
> I think that my Government is ready to enter into such cooperation with any nation if the goal is peace. We will travel to the Moon or any other planet together, and we will not hoist our own flag, but the banner of the entire world.

This was a very fortunate statement, because it was read by the Russian scientists, and several days later when a Soviet space vehicle actually hit the moon the top Soviet scientist, Academician A. V. Topchiyev, issued practically the same statement, viz, that the Russians would not claim the Moon for themselves, but for all humanity.

On September 12, 1959, we received the news of the Russian effort to hit the Moon, and I again issued a statement pursuant to our report of August 25, 1959, that this feat was highly possible and that if the Russians did accomplish it, they are entitled to receive the congratulations of the world.

3. WEST GERMANY

Atlantic Bridge Conference

Originally, I had planned to proceed by train to West Berlin, then visit Prague and Vienna for a few brief days, and conclude my tour in Italy. Some of us in the group, including myself, had acquired bad colds and virus infections. We decided to go to Italy first, in the hope of finding sunshine and warmer weather. No sooner did I reach Rome than I received an invitation to attend the Atlantic Bridge Conference at Bad Godesberg, near Bonn, West Germany, as a member of the U.S. delegation.

This was a meeting of West German and American statesmen, political leaders, scholars, journalists, and others, convened during October 1–4, for the purpose of discussing East–West tensions. Specifically, the purpose of the Atlantic Bridge Conference was to review and reassure United States-German friendship, particularly in the light of the Khrushchev visit to the United States in September, which had aroused some misunderstanding in Germany.

The conference was attended, among others, by President Luebke, of the West German Federal Republic, Chancellor Konrad Adenauer, Mayor Willy Brandt of West Berlin, Prof. Carlo Schmid, vice president of the Bundestag and a recent candidate for the Germany presidency, and leading West German parliamentarians. On the American side were such men as former Secretary of State Dean Acheson, Gen. James M. Gavin, John J. McCloy, Gov. Robert Meyner of New Jersey, Senator Thomas J. Dodd, Senator Kenneth B. Keating, Senator A. S. Mike Monroney and Representative Alvin M. Bentley. (For a complete list of both the American and the West German delegations see the appendix.)

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The first reaction I got was that the Germans were disappointed with President Eisenhower's statement in which he remarked that he did not know what the future policy regarding West Berlin would be. The Germans thought we had fallen for another Communist propaganda stunt. The U.S. delegation tried to reassure them that we had no intentions of falling for any propaganda stunt, and that we would never desert our allies.

The following are quotations from the German speakers at the conference:

"Berlin is the centerpiece of Europe."

"A free Europe without West Berlin cannot be imagined."

A Gallup poll taken shows that 65 percent of all Germans answered that Germany and all Europe could not exist without the United States; 57 percent of all Germans answered that the United States enjoyed the confidence, friendship, and faith of the German people.

The President of the Bundestag said, "A majority of all Germans think of security first, and the unity of Germany second."

"The making of two peace treaties will only mean the petrification of the permanent division of Germany."

Germany wants to defend itself against the U.S.S.R., and wants nuclear as well as conventional arms. They don't want U.S. troops to leave Germany; as a matter of fact, they want them increased. As they put it, "Each soldier removed increases the danger of the war in Europe becoming an atomic war." Odd as it may seem, they even want the French soldiers to return to Germany.

For a résumé of the Atlantic Bridge Conference see the memorandum to me by Dr. Walter Stahl, dated October 15, 1959, entitled "American-German Talks in Bad Godesberg," in the appendix.

West Berlin

On October 2, I met Mayor Willy Brandt of West Berlin, with whom I had a lengthy chat, particularly regarding the Berlin corridor. I had proposed to him a plan for a long-term lease of a corridor linking West Berlin with the West German Federal Republic. The corridor could be used to establish rail and autobahn logistic lines and communications to support the city of Berlin and its population. There are historical precedents for such an arrangement, and I felt that this could be a logical solution to the Berlin problem, since it would insure free access to the city, which is now isolated from the rest of West Germany. Mayor Brandt seemed to like the proposal, and assured me he would give it further thought.

Later that day, together with Captain Berg, I crossed the West German border in a U.S. military car on the way to West Berlin. Both Captain Berg and I wanted to go through the autobahn, the 110-mile stretch which separates West Germany from West Berlin. This road is seldom crossed by American public officials, who are discouraged from crossing it by the American Embassy in Germany, because of a desire to avoid incidents with the Soviet soldiers policing it. We, too, were asked to use the airlines. Since the Khrushchev-Eisenhower talks had just been concluded in the United States, I did not believe there would be any incidents, and I insisted on going through the autobahn. The experience was definitely worthwhile. We were stopped twice by Soviet soldiers on entering the autobahn, and twice more before entering West Berlin. They were

most polite, and no delay occurred. However, we noticed that West Germans making the same crossing went through all sorts of difficulties. They were accosted by East German soldiers, were required to pay a handsome toll (about $2.50 per round trip), and experienced delays of many hours.

We spent a day in West Berlin and then decided to go through East Berlin, again in a U.S. military car, which was not stopped by Soviet soldiers, although four East German soldiers attempted to stop us. Once, while inside East Berlin, our escort officer, Daniel Webster Montenegro, ordered the driver to go ahead, ignoring the signal to stop (since we do not recognize East Germany). The East German soldiers immediately stepped aside and saluted us. "You see," said the escort officer, "they only respect authority."

One must see both West Berlin and East Berlin to appreciate the remarkable difference between them. West Berlin has been reconstructed, and gives the appearance of New York City at night; while East Berlin is still in ruins. East Berliners go to West Berlin to shop, even though their mark has only one-fourth of its value in West Berlin. The reason for this is that the shops in West Berlin are full of merchandise and almost anything can be bought there, while there are few shops in East Berlin and these carry only the bare necessities. Some East Berlin girls, I understand, make the crossing dressed only in a raincoat or an old heavy coat, and come back fully clothed.

There are less than 8,000 Jews left in West Berlin out of some 200,000 who lived there prior to World War II. The municipal government, headed by Mayor Willy Brandt, is helping them build a synagogue, and has wholly accepted them as West Berlin citizens with all the rights and privileges of other West Berliners.

Even though you can look across the street from East to West Berlin and vice versa, you cannot make a direct telephone call to a friend or relative there. You have to place the call through Frankfurt and Leipzig. Not long ago it was required that the call be relayed through Moscow in order to talk with someone who was only 200 yards away.

Before my departure from Germany on October 3, I prepared the following statement which was released from West Berlin to the press:

It would seem to me that a conclusive solution must be found that will insure free access to isolated West Berlin. A solution which occurs to me would be a long-term lease of a corridor linking West Berlin with the Federal Republic of Germany. This corridor could then be used to establish the rail and autobahn logistic lines and communications to support the city of Berlin. There are historical precedents for such an arrangement.

It is unrealistic to let West Berlin, which is the "centerpiece" of West Germany, hang in midair. It is like taking New York City out of the United States and placing it some 110 miles beyond the U.S. border in Canada, no matter how friendly the relations between the two countries would be.

It was ridiculous the number of times we were stopped by Soviet soldiers while going through the Berlin corridor, even though I was traveling in a U.S. military vehicle. As far as the West Germans are concerned, they have to wait hours upon hours before they are cleared. We saw huge lines of West German cars waiting for clearance.

Here is a positive way in which the U.S.S.R. can demonstrate its desire to seek a peaceful solution of the awkward Berlin question. Having decided the principle of a lease arrangement, its terms could easily be worked out satisfactorily to both sides.

4. ITALY

I returned to Italy on October 4, and remained there until my departure for the United States on October 22. While in Italy, I traveled extensively throughout the country to observe conditions, especially the inroads of communism in certain areas, such as Sicily, where the Communists have gained a strong foothold recently. In my talks with the people and with representatives of the press, I sought to meet the onslaught of communism and to fight off its influence.

I noticed in Italy, as well as in some of the other European countries I visited, that there is hardly any middle class. Monopolies and cartels seem to grip the life of the people in those countries. A very few people make huge profits, but these profits are not passed down or shared in any way with the workers, who receive low wages and are barely able to eke them out and obtain the necessities of life. This system breeds communism. Our economic aid will be of little value unless considerable changes are made to benefit the people more directly.

In Palermo, Sicily, I was invited to participate in the Columbus Day celebration on October 12, and to deliver an address. I utilized this opportunity to present my views on the danger of communism. My address, I was later told, was well received and had a favorable effect throughout Sicily. The press reported it widely. (See the appendix for the full text of my address at Palermo.)

Two days later, while at Naples, I addressed a letter to Senator Lyndon Johnson, chairman of the Senate Aeronautical and Space Committee, sending a copy of the same letter to Representative Overton Brooks, chairman of our own committee, in which I urged them to call a joint meeting of the Senate and House Space Committees early in November—

to determine direction and money needed to unite exploratory research and development programs in space sciences under single head, avoid unnecessary duplication, and to surpass the Russians.

The following is the text of the letter:

AMERICAN CONSULATE GENERAL,
Naples, Italy, October 14, 1959.

HON. LYNDON JOHNSON,
Senate Majority Leader and Chairman,
Senate Space Committee, U.S. Senate.

DEAR LYNDON: The Soviet outer space race offers threat that discoveries may be diverted to war purposes, thus endangering the whole world. The United States has many firsts, but cannot afford being second in this field. Even now countries abroad fear Soviet Union is stronger. We must reassure our own people and allies that the United States will always remain superior to deal with the enemies of the free world. To accomplish this we must recognize the urgency of an all-out space program and that a balanced budget on paper is no substitute for security. Soviets are ready to make any sacrifice to achieve supremacy over the United States. * * *

All conferences with the Soviet Union, including those at the summit, unfortunately fall into a Communist propaganda pattern and are used by the Russians to soften and relax us and to convince our allies and neutral countries that it is useless for them to oppose communism since we are about to embrace it. We must get it into our heads that the Communist threat will always exist since its policy is world subversion.

We cannot change our philosophy and the Communists will definitely not change theirs. Therefore, we should only engage the Soviets in special projects

such as cooperation in the peaceful exploration of outer space to determine whether coexistence is possible.

Mindful of the precious time we are wasting I urge you to assume the leadership our country sorely needs at once and not wait for Congress to reconvene. Please get together with your counterpart in the House, the Honorable Overton Brooks, and call a joint meeting of the Senate and House Space Committees early in November. Have appear Defense Department and NASA witnesses to determine direction and money needed to unite exploratory research and development programs in space sciences under single head, avoid unnecessary duplication, and to surpass the Russians. Congress can then pass the adopted proposals in January.

A further report from me will follow.

I am sending this to you now since I shall not return until October 30, in order that such action as you may see fit may be undertaken in the meantime.

As always,

Sincerely yours,

Congressman VICTOR L. ANFUSO,
Chairman, House Space Subcommittee on International Cooperation and Security.

AMERICAN CONSUL GENERAL,
Naples, Italy, October 14, 1959.

Hon. OVERTON BROOKS,
Chairman, House Space Committee,
U.S. House of Representatives.

DEAR OVERTON: Enclosed you will please find a copy of a letter which I have this day addressed to our friend, Lyndon Johnson. I hope that you agree with its contents and that you will take immediate steps to bring about the meeting that I have suggested.

With warm regards, I am,

Sincerely yours,

Congressman VICTOR L. ANFUSO,
Chairman, House Space Subcommittee on International Cooperation and Security.

Enclosure: To Hon. Lyndon Johnson, October 14, 1959.

BONHAM, TEX., *October 24, 1959.*

Hon. VICTOR L. ANFUSO,
Member of Congress, House of Representatives,
Washington, D.C.

DEAR VICTOR: Thanks for sending me a copy of your very informative letter to Lyndon Johnson.

We must get on our toes and stay there unless we are to be swamped by Russia. I want to congratulate you on the wonderful work that you are doing along these lines.

With every good wish, I am,

Sincerely yours,

SAM RAYBURN,
Speaker of the House of Representatives.

SHREVEPORT, LA., *October 26, 1959.*

Hon. VICTOR L. ANFUSO,
Chairman, Subcommittee on International Cooperation and Security,
Committee on Science and Astronautics,
House of Representatives, Washington, D.C.

DEAR VICTOR: I have received the carbon copy of the letter which you wrote to Hon. Lyndon Johnson, Senate majority leader and chairman of the Senate Aeronautical and Space Sciences Committee. Lyndon is a neighbor of mine in these parts and I am happy that you have displayed so much confidence in him as shown by your letter. You suggest that we have a joint meeting of the Senate and House Space Committees while Congress is in adjournment.

I wish to call to your attention the fact that you are the only one who has indicated an interest in such a meeting. None of the other committee members has indicated an interest and, frankly, at this time I am not prepared to go along with you in this proposal.

One of our great problems of the coming year is going to be to push the space program so as to overtake Russia and I anticipate lots of pleasure in working with Lyndon Johnson on this program. As a matter of fact, I am going to be in Washington, perhaps twice, prior to the convening of Congress with the idea of pushing our space program.

I am sending a copy of this letter to Hon. Lyndon Johnson that he may know of the committee's sentiments on the matter.

With kind personal regards, I am,

Sincerely yours,

OVERTON BROOKS,
Chairman, Committee on Science and Astronautics, House of Representatives.

B. TWO SIGNIFICANT PROPOSALS ON INTERNATIONAL COOPERATION

I have given a good deal of thought to this matter in recent weeks and months, and I would like to make two significant proposals:

(1) I strongly recommend that the U.S. Government establish combined science and economics teams, one such team for each of the countries allied with us, which are to work in cooperation with similar teams in the respective countries. These teams should be composed of not more than 10 men and women on each side and should include experts in the fields of science, engineering, economics, and technological development. Each of these joint teams should work constantly together in the field of operations, in studying the ways and means of strengthening the particular country, in making it a working partner of the United States, and thus helping to strengthen the free world as a whole.

It would be advisable, I believe, for the United States to enter into agreements, either on a bilateral or multilateral basis, with nations desiring to establish this economic partnership with the United States. Under these agreements, we could explore the specific needs of each of these countries, their economic problems, their resources and the exploitation of such resources for our mutual benefit, the type of aid and the funds needed, and then we could jointly direct our efforts and our aid toward the fuller development of those countries. Such relationship would also serve as a contributing factor toward the establishment of closer unity between the United States and these nations, better understanding among our peoples, and a strengthening of our combined forces.

Perhaps we may find it logical or desirable to set up a special international agency, as an adjunct of our foreign policy, to conduct these specialized joint international activities, something like joint economic teams (JET).

(2) I recommend that more of our foreign aid in the future be directed toward training the youth of the free world in science, mathematics, engineering, and other technological studies, in order to match the growing strength of the Russians in education. Let us provide help in the establishment of schools in allied countries to emphasize these subjects. Let us provide a stipend to those interested in these fields, so that they are encouraged to continue their studies. Let us bring over to the United States for a year or two of specialization those who show great promise in their studies. Let us provide them with

the opportunity of pursuing their research work, either in their own country or in ours.

In this way, I feel certain, we can help close the serious gap which now exists in our efforts to maintain our position over the Russians and to help those nations who are allied with us in the common struggle. Our society and our way of life must remain free at all costs, but the costs will be much less if our efforts are undertaken in a cooperative manner and under vigorous leadership. Only in this way can we meet head on the challenge of the economic and social problems confronting many of our allies and uncommitted countries that are looking to us for guidance and leadership.

We may not have much time left. We may not have too many opportunities left in the years to come. The American people should be galvanized into spirited action, into doing their very best for those whose help we can count on, in giving them the kind of aid they need most and which will prove of most benefit to them and to us.

C. Advantages and Obstacles in the Way of International Cooperation in Astronautical Explorations

1. GENERAL DISCUSSION

In order to sell the concept of international cooperation in astronautical endeavors to our own country and to other countries, it is necessary that a specific program be drawn up which can form the basis for negotiations. This program can then be sold in terms of advantages and disadvantages for the participating countries. It is not realistic at this time to assume that international cooperation can be attained completely across the board in all astronautical endeavors. The potential military applications of some of these devices will make the various participating countries view cooperation with suspicion and cynicism. It is, therefore, essential that the overall field of astronautical explorations and operations be examined in order to divide the field into discreet areas where international cooperation is easy to obtain and to steer shy of those areas where military applications are most likely to be found.

As a beginning, the astronautical effort can be divided into three general categories. The first one is obviously the exploratory, research and development area. The next two categories cover the application of the knowledge, technique, and devices brought about by the research and development. These are, first, the commercial use of astronautical devices and, second, the military utilization of astronautical devices.

2. EXPLORATORY RESEARCH AND DEVELOPMENT

Work in the astronautics area was started even before the IGY in 1957. It even predates the high altitude research conducted both by the Soviets and by the United States, starting as early as 1948.

Another major advantage of a fully coordinated program is the mutual support between nations which can be provided in data read-out facilities. The satellites in orbit about the Earth continually sample the physical phenomenon involved in the particular experiment. Unfortunately, the coverage available due to the limited geographical distribution of data read-out stations, which is in accord-

ance with national boundaries, degrades the experiments conducted by either the United States or the Soviets. The data is deficient because it can be read out of the satellite only in restricted areas. By setting up full cooperation in data gathering, the Earth's surface could be divided into areas of responsibility where specified countries would be assigned data read-out responsibilities. The more comprehensive coverage available as a result of this cooperation will permit the conduct of more complex experiments with a simplification of memory storage and a more complete set of observation data. This should provide a great acceleration in gathering complete data on the physical phenomenon which control the affairs of our universe.

In the conduct of deep space operations, including voyages to the moon, tracking stations must be established which can keep the flight article under continual surveillance. As soon as the flight article leaves the environs of the Earth, it will appear in the skies in a relatively fixed angular position similar to other celestrial bodies which rise and set each day as the Earth revolves about its axis. Any tracking station located on the Earth's surface will see the flight article rise above the horizon and then at the end of the "new day" set below the horizon. *For deep space penetrations with en route guidance controlled from the surface of the Earth, continual tracking surveillance will be mandatory. This can be accomplished only if tracking stations are suitably located.*

An even more critical need for international cooperation in space operations is in regaining control of space capsules returning to the vicinity of the Earth from the Moon, or planets, or, even later, from outer space. In order to prevent an uncontrolled reentry into the earth's atmosphere, thereby courting the danger of destruction through frictional hearing, the space capsule must be detected as soon as it approaches the Earth so that it can be commanded into an appropriate "parking orbit" prior to starting reentry into the Earth's atmosphere. After the capsule is "parked" in this orbit, recovery forces can then be properly mobilized and deployed on the Earth's surface to maximize the survival probability. The critical importance for complete international cooperation in operations of this type is obvious. The stakes involved are too high to court the danger of unnecessary destruction and the loss of life when the capsule later becomes manned. If operations of this type are attempted without complete international cooperation, it is possible for such a capsule to return to the Earth, plunge into the atmosphere, burn up, and the responsible command may never know what happened.

3. ADVANTAGES TO THE RUSSIANS

The argument may be advanced by the Russians that since they are presently advanced in some phases of space research they have no need to cooperate. This problem is far more acute for the Soviets since they control a much smaller percentage of the Earth's surface, thereby limiting the optimum distribution of tracking stations. The Soviets should be extremely anxious to participate on an international basis for operations of this type. As a matter of fact, the United States enjoys a tremendous strategic advantage over the Soviets because of the large area accessible to the United States but which is essentially denied to the Soviets. This advantage can be of the same

significance for the future as the strategic distribution of "coaling stations" was for the British Empire during the 19th century.

As soon as the astronautical programs progress to the point where man is introduced into the space environment, logistic support for control and recovery operations must be distributed in accordance with the requirements of the operation rather than in accordance with national jurisdictional boundaries. This is an item of very grave importance. In recovering a human being from an orbit, if everything in the recovery operation works in accordance with plans, a relatively small area on the Earth's surface need be instrumented and equipped as a recovery area. However, we must recognize that it is always at the crucial moment when things go wrong that some emergency plan must be available. If the planned recovery scheme fails to operate as scheduled, a very serious problem will arise in determining where the man will reenter so that proper steps can be taken to optimize his chances of survival. By providing the Soviets with the support needed to cover themselves in case of such an emergency, they should be quite interested in the possibilities offered by an international cooperation organization.

4. COMMERCIAL APPLICATION

Sooner or later, if some of the promises held forth by the astronautical experts come to pass, mankind will undoubtedly be establishing satellite systems having commercial utility. There are a few obvious examples which are apparent at the present time. The communications satellite program, now being conducted by ARPA, can, with a relatively small amount of effort, duplicate the communication capability of the North Atlantic cable system. When it is recognized that the effort which was required to establish the North Atlantic cable system was a matter of many years and many millions of dollars, the advantages of such a satellite system immediately become apparent. There is as yet no organization in the United States which is able to establish a communications system for commercial use without bringing into play the argument of private enterprise versus public utilities. It appears obvious that a governmental or world agency will have to be set up to establish and operate, at least initially, such astronautical systems.

Another example is in the field of providing data to improve weather forecasting. The use of a satellite appears to be an ideal mechanism to gather information to improve our forecasting capability, provided that the data-aging problem can be solved. Again, it does not appear reasonable to expect a commercial agency to take on the responsibility of placing into orbit and operating such a weather data collecting system and forecasting service. The only alternative, again, appears to be that some governmental or world agency assume responsibility for this task. The charter of the U.S. Weather Bureau is too parochial for this responsibility.

These two examples are illustrative of numerous others which are bound to follow as the science of astronautics advances. The obvious conclusion is that a world agency must be eventually established to assume the overall responsibility. This agency could then also provide the mechanism through which international cooperation can be established.

In order to insure that these astronautical systems are kept technically simple, every effort should be made to avoid useless duplication and to prevent needless incompatibility. The incompatibility of the European TV network is a good example of what must be avoided. There also does not appear to be any reason why weather data should be observed and processed by two or more independent satellite systems. A single world weather data gathering system should be able to suffice for the requirements of the various countries who could then use this data in formulating their own area forecasts.

PART III. U.S.-EUROPEAN COLLABORATION ON SCIENTIFIC RESEARCH AND DEVELOPMENT

SUMMARY

Following the London Congress of the International Astronautical Federation, a second committee group undertook (1) an extensive inspection tour of certain scientific research and development installations of common interest to the United States and its allies, and (2) a series of conferences with American defense officials whose work relates to scientific research.

The committee delegation was composed of Representatives David M. Hall, of North Carolina, A. D. Baumhart, Jr., of Ohio, and, during part of the inspection, William K. Van Pelt, of Wisconsin. Vice Adm. John T. Hayward, Deputy Chief of Naval Operations for Development, accompanied the group.

Research centers and groups visited by the delegation, in chronological order, were as follows:

London, England:
- Office of Naval Research (ONR London).
- Mutual Weapons Development Program (MWDP).

Paris, France:
- Headquarters, U.S. European Command.
- Supreme Headquarters, Allied Powers Europe (SHAPE).
- NATO Advisory Group for Aeronautical Research and Development (AGARD).
- NATO Science Advisory Committee.

Rhode-Saint-Genese, Belgium: Training Center for Experimental Aerodynamics (TCEA).

Brussels, Belgium: European Office, Air Research and Development Command (EO–ARDC).

The Hague, Netherlands: SHAPE Air Defense Technical Center.

Oslo, Norway: Norwegian Defense Research Establishment.

Naples, Italy:
- NATO Headquarters, Allied Forces Southern Europe.
- Headquarters, U.S. Naval Activities Mediterranean.

La Spezia, Italy: Oceanographic and Antisubmarine Warfare Research Center, operating under the Supreme Allied Commander, Atlantic Forces.

The committee group was fortunate in being able to confer directly with Lt. Gen. T. B. Larkin, U.S.A. (retired), director of the Mutual Weapons Development Team, Paris; Gen. Lauris Norstad, Supreme Allied Commander Europe; and Adm. Charles R. Brown, Commander of the Allied Forces, Southern Europe. It was equally fortunate in meeting the civilian scientific heads of the research staffs of these officials and the directing officers of the research and development centers mentioned in the foregoing.

It was thus possible for the committee group to obtain (1) a working picture of the functions and operations involved, (2) a reasonably

broad understanding of policy and overall contemporary problems, and (3) some impressions of the scientific obstacles immediately confronting the free world.

However, except for the descriptive matter set out in the appendix concerning certain activities of ONR London, AGARD, the NATO Science Advisory Committee, TCEA, and EO–ARDC, all information on research programs surveyed and conferences held is classified. It cannot be discussed here in specific terms.

Findings

In spite of the restrictions thus imposed, it is nonetheless possible to make certain general observations which may be helpful to the full committee.

These are as follows:

(1) The amount of scientific research and development collaboration between the United States and Western European communities, at least in regard to exchanges of information on basic science, appears to be on a moderately high level and is increasing.

(2) Collaboration on applied research and development is also on the upgrade. It is, in fact, being emphasized, although, for security reasons, it may be gaining momentum less rapidly than desired.

(3) A high percentage of all such collaboration today occurs through channels made possible by two political devices at the international level—namely, the North Atlantic Treaty Organization and the Mutual Weapons Development Program.

(4) The United States continues to bear a major financial load in fostering this collaboration on scientific research and development.

(5) Other countries of Western Europe, however, are demonstrating a willingness to contribute more in this field in terms of facilities, personnel, advisory talent, and money. In many instances where joint research is involved, it appears that the overall share of European scientific teams has risen considerably in the past few years.

(6) Thus, while the total American effort in these collaborative programs may not have diminished—in fact, it may have increased—the relative burden of the United States would appear, in a number of instances, to be decreasing.

(7) In spite of the fact that scientific research and development collaboration is increasing at all levels, the marked emphasis on applied defense research throws into clear relief the corollary fact that actual experimental programs involving pure or basic research are meager.

(8) In the European phase of American scientific endeavor, then, the demonstrated interest of U.S. agencies does not include much basic research—with the exception of ONR London, which gives information coverage to every aspect of scientific research and development on the European scene.

Conclusions

From the foregoing observations, and keeping in mind that the welfare and security of the United States—through science and astronautics—are the paramount concern of the committee, the following conclusions are offered for the consideration of members:

(1) The welfare of the Nation, today more than ever before, depends not merely on "keeping up" in the scientific world but on

remaining in the van. Since science itself is a broad avenue unlikely to be completely dominated by any one nation, it is therefore essential that the United States promote more effective research collaboration with the proven talents of West European scientists. To fail in this may be courting disaster; at least, the American scientific effort will be slowed proportionately.

(2) While the United States is putting substantial sums into cooperative research and development programs with European nations, we do not appear to be getting the most out of them because of security policies. Without recommending a general relaxation of security measures, it is suggested that a review and possible modification of these measures—especially in cases where cooperating European scientists are placed at a disadvantage through denial of information necessary to do the job America asks them to do—would result in a financial saving to the United States while improving our national security.

(3) Since many of our most eminent scientists are showing concern over the fact that technological development today is "scraping the bottom of the barrel" and that major basic science breakthroughs are needed, it would appear that continued concentration on developmental research at the expense of experimental basic research is shortsighted in the extreme. Toward this end, and since there appears to be only minor collaboration in this field, it is suggested that the United States accelerate joint basic research programs with its allies as rapidly as possible.

(4) Since the foregoing paragraph clearly applies in the field of astronautics and since the United States is just as clearly trailing in various aspects of space exploration, it is further suggested that the National Aeronautics and Space Administration be provided the necessary funds and stimulus to take real advantage of the European scientific talent which is willing and able to help—perhaps to the extent of establishing its own liaison office in Western Europe.

APPENDIX

[From the Congressional Record]

Is Space the Way to Peace and Abundance?

(Address by Hon. Victor L. Anfuso at the 10th Annual Congress of the International Astronautical Federation, London, England, September 4, 1959)

Mr. Chairman, distinguished members of this congress, and guests, at the outset, I wish to congratulate the members of the International Astronautical Federation and particularly its illustrious president, Mr. Andrew G. Haley, for bringing us together. Mr. Haley, as an organizer and as a pioneer in the field of international cooperation and space law, has no peer.

As a member of the Science and Astronautics Committee of the U.S. House of Representatives, I feel that on this occasion we can share a few thoughts of common interest.

Let us first face the fact that never in its history has the world been so near to destroying itself; that never before has so much deception in diplomacy been practiced and that never has there been so much talk of peace, while all the planning is for war. The situation is like inviting someone to your home for dinner, while making arrangements for his demise.

It is in this kind of world that we must seek the ingredients for peace.

We know that man has already discovered a new world—many times larger than the world Columbus found—but it is one of unexplored horizons. We have opened the door to the heavens' pathless way. The questions now being asked are these: Will what we find there be good or evil? Will it prove to be a boon to humanity, or are we getting nearer to the day of destruction?

As we look back over the recent past, it is hard to believe that man's efforts to penetrate outer space came to fruition less than 2 years ago. Prior to that time, most people regarded satellite orbits and interplanetary travel as nothing more than the fantasies of children or visionaries, of comic-strip cartoonists or science-fiction writers. During these past 2 years everyone has come to recognize that the practicality of space flight has been demonstrated. The impact of all this on people's minds has been unprecedented. Of all the wonders wrought by the progress of science and technology, it seems to me that none before—not even nuclear energy—has opened such vistas for mankind. Certainly none has ever promised to free us, while still alive, from the earth itself.

At this great international gathering, it is fitting to review the material benefits, in new knowledge and the practical applications thereof, which we may reasonably expect from man's future explorations in outer space. No less important is it for us to consider the prospects that may be offered for permanent world peace. But we must not let ourselves be so dazzled by these glittering possibilities that we forget the deeper meaning of our emergence into outer space. I refer, of course, to man's moral sense, his curiosity and capacity for wonder, his faith and reverence in God, and his spirit of adventure.

I shall not waste the time of this learned audience with details of the possibilities which the exploration of space has to offer. As a layman, I am interested in the practical aspects of these discoveries and particularly how this will affect our daily lives. I am interested, for example, in the observation made by Dr. James Van Allen who said that the progress of space science and technology will bring (and I quote):

"A rich and continuing harvest of important practical applications. Many of these applications will be of military value; but their greater value will be to the civilian community at large."

Dr. Fred Whipple, Director of the Smithsonian Astrophysical Observatory, said:

"Weather forecasting, in my opinion, will become a science instead of an art. I predict that its value to the country will greatly outweigh the cost of the entire (space) program."

Dr. Wernher von Braun said that communication satellites will not only pay for themselves, "but pay for trips to the Moon and other ventures in this business."

The few examples I have cited could be multiplied many times. They are the serious predictions of responsible and eminent men.

I am convinced that the expansion of knowledge and its applications can be speeded up by providing greater incentive for scientific and engineering efforts. Accordingly, I introduced a bill in Congress in April of this year, known as H.R. 6288. It calls for the creation of a Presidential Medal of Science, which is to be awarded to persons who make outstanding contributions in the physical, biological, mathematical or engineering sciences. Needless to say, achievements in the space sciences and technology are included. My bill was passed unanimously by the House of Representatives on August 19, 1959, and 2 days later by the Senate of the United States. I trust that this law will serve as an incentive for further scientific progress.

I am further convinced that the progress of space science and technology and the peaceful uses of outer space will be greatly facilitated by a full partnership of cooperating nations. Many projects in outer space, which could benefit all mankind, would be literally impossible without international cooperation, for example, if they required the use of worldwide tracking or telemetering equipment or of launching sites in certain geographical locations. Costs alone will prevent some nations, or even any one nation, from undertaking certain ambitious space operations. Some of these space projects can be done better and more cheaply if they are carried out as joint enterprises of two or more nations.

There is reason to hope that a good deal of international cooperation in the peaceful uses of outerspace will be forthcoming in the foreseeable future. A good beginning has already been made. The cooperation of many nations in the International Geophysical Year (IGY) and the Committee on Space Research (Cospar) established by the International Council of Scientific Unions, has been most encouraging. Even the United Nations Ad Hoc Committee on the Peaceful Uses of Outer Space has produced some valuable results, although several nations have refused to participate in its work on the ground that its membership is unrepresentative. This situation should be corrected as soon as possible.

I propose that all governments interested in the peaceful uses of outer space should create a Committee on Space Cooperation, with fair representation from the Communist and non-Communist worlds. In my opinion, the committee should be established within the framework of the United Nations. In any event, its functions would be the exploration and development of outer space in the common interest of all mankind. If subcommittees were subsequently formed in the various member nations, I would hope that in my own country, at least, suitable representation would be provided for science, industry, and the Government, and that both the legislative and executive branches of Government would be represented in its membership.

The challenge of outer space demands a full and true partnership, first among nations, then among science, industry, and government. To deny such participation in the peaceful exploits into outer space would widen the no man's land barrier presently existing between the Western and Communist worlds and would invite further full-scale competition. The discoveries then, on both sides, could easily be diverted, not to create a peaceful and closer knit world of abundance where no one need be in want, but to create even more menacing ways of destroying the world than we have today. Thus we would all be the losers in such competition.

Prior to attending this meeting, I addressed letters to both President Eisenhower and Prime Minister Khrushchev urging that they discuss this one area of possible agreement as a step toward world unity. I have further suggested that this proposal be given consideration by the United Nations and the NATO powers prior to the meeting of the heads of state.

An example of what can be done by joint peaceful cooperation is the agreement reached in April of this year between the United States and Canada in ionospheric research.

Another example is the agreement announced only July 29 of this year between the United States and Great Britain under which agreement British scientists will prepare the instrumentation for satellites to be put into orbit by the United States.

Still another forward step in the joint use of outer space is being taken by the International Telecommunications Union, which is meeting at this moment in Geneva.

I believe that agreement on space frequencies could set a pattern for multilateral cooperation in other space activities. Through their partnership in outer

space, nations can learn the ways of meaningful cooperation on earth. Certainly cooperation is a more fruitful and more effective method than coercion—or even mere coexistence—if our goals are peace and abundance.

Whether mankind's emergence into outer space will serve the cause of peace is still a matter of hope, rather than conviction. It is true that space technology can be used for either peace or war. For that very reason, however, war has become all the more obnoxious and impractical. General Lemnitzer, the U.S. Army Chief of Staff, predicted recently that missiles will soon create "strategic nuclear disarmament," becoming so numerous and relatively invulnerable that no attack can prevent retaliation.

Regardless of such military considerations, I feel strongly that an arms race to dominate outer space must be avoided. National rivalries should be confined to the Earth—and, if possible, buried there for all times.

Some observers have suggested that enterprises in outer space will provide mankind with a moral equivalent of war. Early in this century, the American philosopher and psychologist, William James, made the following comment:

"What we now need to discover in the social realm is the moral equivalent of war; something heroic that will speak to men as universally as war does and yet will be as compatible with their spiritual selves as war has proved itself to be incompatible."

We may reasonably conjecture that in the vastness of outer space man may at last find a moral equivalent of war, to evoke and satisfy his longing for adventure, his fascination with the unknown, his need to be challenged and tested to the final limit of his strength.

In addition, it is fortunate that space technology may provide the means, at long last, to maintain world peace. The risk of surprise attack, for example, could be minimized by a system of international satellite surveillance.

Perhaps the immensity of the cosmos and the new knowledge of its mysteries resulting from space exploration will bring the peoples of the world closer together in new patterns of cooperation. Is it too much to hope that man's mind and spirit will expand with the scope of his activities?

Let me conclude by saying that space can be, if we will, a way to world peace as well as abundance. If earthmen can get together on this one thing—the peaceful exploration of outer space—then that very space can be the way to the creation of a world of abundance, making war outmoded and unnecessary.

Remarks by Prof. L. I. Sedov, U.S.S.R. at IAF Congress

Following are the remarks by Prof. Leonid I. Sedov of the U.S.S.R. Academy of Sciences upon his election as President of the International Astronautical Federation at the 10th IAF Congress in London, September 5, 1959:

"I am very grateful for the great honor which you bestowed upon me by electing me President of the International Astronautical Federation. I consider this as a token of respect for Soviet science and as an acknowledgment of the successes achieved by the U.S.S.R. in penetrating cosmic space.

"On my part I shall try to make every effort toward the extension of international cooperation in the field of astronautics and the achievement for the IAF of greater influence in the development of the science and technology of interplanetary communications.

"Like all other scientific developments we have to contend with all sorts of doubts and critical considerations about the usefulness of an intensive development of space research. In this context I should like to say that the space research of today is the logical consequence of scientific and technical progress. The results of this research are of very great importance for man's knowledge of nature and are a natural stage in the history of civilization. I am convinced that space flights in future will have a great and direct practical importance for mankind.

"I think that I shall express everybody's opinion if I say that the switching to astronautics of the financial resources and creative efforts of scientists and engineers, which are still expended on preparations for war, would be a substantial contribution to the cause of peace among nations.

"The present general state of international relations favors the further extension of international contacts and cooperation in astronautics.

"There is no doubt that at present we are on the threshold of great new events and remarkable discoveries in space research and interplanetary flight."

FIRST AMERICAN-GERMAN CONFERENCE, BAD GODESBERG, OCTOBER 1–4, 1959

AMERICAN DELEGATION

Hon. Dean Acheson, former Secretary of State, Washington, D.C.
Hon. Victor L. Anfuso, Congressman (Democrat, New York).
Hamilton Fish Armstrong, editor, Foreign Affairs, New York.
Hon. Alvin M. Bentley, Congressman, Owosso, Mich.
Leo Cherne, director, Research Institute of America, New York.
Dr. James B. Conant, former Ambassador to Germany, New York.
Hon. Thomas J. Dodd, Senator, West Hartford, Conn.
Klaus Dohrn, journalist, New York/Zürich.
Christopher Emmet, writer and radio commentator, executive vice president, American Council on Germany, Inc., New York.
Irving Engel, attorney, New York.
James M. Gavin, general (retired), Cambridge, Mass.
Dr. Harry D. Gideonse, president, Brooklyn College, New York.
Hon. Kenneth B. Keating, Senator, Rochester, N.Y.
Dr. Henry A. Kissinger, professor of political science, Cambridge, Mass.
William E. Knox, president, Westinghouse Electric International.
Carl Landauer, professor, University of California, Berkeley.
Louis Lochner, journalist and writer, Fair Haven, N.J.
Hon. John J. McCloy, president, the Chase Manhattan Bank, New York.
Robert B. Meyner, Governor of New Jersey, Trenton, N.J.
Hon. A. S. Mike Monroney, Senator of Oklahoma.
Dr. Philip Mosely, director of studies, Council on Foreign Relations, New York.
Dr. Norbert Muhlen, journalist and writer, New York.
Dr. Shepard Stone, director, the Ford Foundation, New York.
Eric M. Warburg, banker, New York/Hamburg.

GERMAN DELEGATION

Hellmut Becker, lawyer, president, Deutscher Hochschulverband, Kressbrona, Bodensee.
Dr. Arnold Bergstraesser, professor of political science, chairman, Atlantik-Brücke e.V., Freiburg i. Br.
Dr. Kurt Birkenbach, member of the Bundestag (CDU), Düeseldorf.
Erik Blumenfeld, vice chairman and treasurer, Atlantik-Brücke e.V., Hamburg.
Dr. Hans Karl von Borries, president (retired), Ruhr-Stickstoff AG., Essen, of Montagnola/Switzerland.
Willy Brandt, mayor of Berlin (SPD).
Dr. Constantin von Dietze, professor of economics, Freiburg i. Br.
Dr. Marion Gräfen Dönhoff, journalist, Hamburg.
Fritz Erler, Member of the Bundestag (SPD), Pforsheim.
Dr. G. Frhr. von Falkenhausen, personally responsible partner in the banking house of Burkhardt & Co., Essen.
Ernst Friedlaender, journalist, Bad Godesberg.
Dr. Hans Furler, professor of law, Member of the Bundestag (CDU), Freiburg i. Br.
Dr. Johann Baptist Gradl, Member of the Bundestag (CDU), Berlin.
Karl Theodor Frhr. zu Guttenberg, Member of the Bundestag (CDU), Schloss Guttenberg, Stadtsteinach/Ofr.
Kai Uwe von Hassel, Minister President (CDU), Kiel.
Karl Haus, personally responsible partner in the banking house of Sal. Oppenheimer, Jr. & Cie, Köln.
Dr. Hans Hellwig, journalist, Köln.
Kurt-Georg Kiesinger, Minister President (CDU), Stuttgart.
Dr. Paul Leverkuehn, Member of the Bundestag (CDU), Hamburg.
Dr. Klaus Mehnert, journalist, Stuttgart.
Dr. Erich Mende, Member of the Bundestag (FDP), Bad Godesberg.
Dr. h. c. Alexander Menne, member of the managing board, Farbwerke Hoechat AG., Frankfurt/M.
Dr. Karl Mommer, Member of the Bundestag (SPD), Ludwigsburg.
Dr. Carlo Schmid, professor of political science, Vice President of the Bundestag (SPD), Frankfurt/M.
Curt E. Schwab, publisher, Stuttgart.
Werner Traber, member of the managing board, Hapag, Hamburg.
Adalbert Weinstein, journalist, Frankfurt/M.

MEMORANDUM IN RE AMERICAN-GERMAN TALKS IN BAD GODESBERG

ATLANTIK-BRÜCKE E. V.,
Hamburg-Wellingsbüttel, October 15, 1959.

DEAR MR. ANFUSO: Following the pattern of the annual Anglo-German talks held in Königswinter and the Franco-German talks also held each year, the first American-German talks took place last week in Bad Godesberg near Bonn. From October 1 to 4, some 50 prominent American and German politicians, scholars, bankers, and journalists gathered for intensive discussions of "East-West Tensions: Present Status and Future Developments." The American delegation included among others Mr. Dean Acheson, former Secretary of State; Gen. James M. Gavin; Dr. Henry A. Kissinger, of Harvard; Mr. John J. McCloy; Dr. James B. Conant; Gov. Robert Meyner, of New Jersey; Senators Dodd, Keating, and Monroney, and Congressmen Anfuso and Bentley. On the German side were Dr. Arnold Bergstraesser, chairman of the Atlantik-Brücke; Herr Willy Brandt, governing burgomaster of West Berlin; Ernst Friedlaender, journalist; Herr von Hassel, Minister President of Schleswig-Holstein; and Herr Kurt-Georg Kiesinger, Minister President of Baden-Württemberg; Klaus Mehnert, journalist; Carlo Schmid, Vice President of the Bundestag; and Karl Mommer, Erich Mende, Johann Gradl, Fritz Erler and Hans Furler, all Members of the Bundestag.

For the opening ceremonies on October 1, President Lübke; Chancellor Adenauer; Dr. Gerstenmaier, President of the Bundestag; Herr Wilhelm Kaisen, President of the Bundesrat; and members of the Federal Cabinet were present, while Herr von Brentano, the West German Foreign Minister, was present for the summaries of the discussions on October 4. President Lübke welcomed the delegates to the conference and called the theme of the talks extremely significant. The understanding friendship between the Federal Republic and the United States was characterized by the President as "of great importance to the future of Germany." Dr. Gerstenmaier in his speech referred to recent public opinion polls showing that 65 percent of those questioned were convinced that cooperation with the United States was essential for Europe. Dr. Bergstraesser and Mr. McCloy spoke for the Atlantik-Brücke and the American Council on Germany, the two organizations which arranged the talks.

FRANK DISCUSSION

The actual discussions got underway on October 2, after speeches on the military and strategic situation of the United States and the Federal Republic by Dr. Kissinger of Harvard University and Herr Adalbert Weinstein, military publicist. Both speeches set up areas of discussion for the panel groups and the ideas put forward were echoed again in the final summaries.

On October 4, after more than 10 hours of discussions of a frank and open, though never acrimonious, nature, summaries of the discussion were presented and a few final comments were made by various members of the two delegations. In introducing the summaries, Mr. McCloy said that the discussions had been pertinent and there had been a general consensus. He stressed, and this was repeated by other speakers, that there had been no German-American issues, as such. While there had been disagreement among both the Americans and the Germans, there had been no disagreement along purely national lines, and this was encouraging and significant.

NATO AND BERLIN

The summary for the first panel, dealing with aspects and alternatives of the strategic and political situation of the West, was delivered by the group's rapporteur, Dr. Klaus Mehnert. He reported that the pros and cons of disengagement were discussed, the advantage of obtaining certain political possibilities as opposed to the disadvantage of probably having the American troops leave Europe. This latter was considered highly undesirable. No one was in favor of uncontrolled disarmament, while there was feeling that NATO should perhaps be strengthened. It was emphasized that security was not an end in itself, but only a beginning, a precondition for the attainment of freedom. Mr. Acheson's suggestions of a wider Atlantic alliance with political and economic aims, rather than military, so that it could embrace such countries as Sweden and Switzerland, was of particular interest.

In reference to Berlin, it was quite generally agreed that the status quo, if by that was understood the presence in the city of Allied troops, must be maintained. There could be no negotiation on that point and no one was in favor of disengagement in Berlin under the present conditions. The freedom of 2½ million Berliners was important and a symbol that the division of Germany was not final and irrevocable. Senators Keating and Dodd reaffirmed this. Herr Mommer said there was virtually no disagreement on this score between the Government and the opposition, and Herr Gradl, member of the Bundestag from Berlin, took the opportunity to say that Berlin and Germany were again grateful to see that there was no trace of doubt concerning the American resolution to hold and defend Berlin. Coming back to this point later, Dr. Conant said he believed the free world needed to be given more frequent information on conditions in the Soviet zone of Germany.

REUNIFICATION—A COMMON GOAL

It was emphasized that reunification would remain the goal of both German and American-German policy and that every peaceful possibility must be made use of to attain this goal. Herr Mommer stressed later that only reunification in safety and peace would be acceptable, and Herr Mende added that Germany would rather remain divided than accept reunification under Soviet domination.

As to the Oder-Neisse line, no warlike solution of this problem was thinkable; the future German eastern frontier must be the result of peaceful compromise between friendly neighbors. It was felt that reunification should come first, so that Poland could be assured that the settlement, when it came, had the backing of all Germany and not just that part under Soviet domination.

This group also considered the spiritual challenge, the twin problems of ideology and education. Dr. Gideonse, president of Brooklyn College, New York, who was a guest professor at the Free University of Berlin 3 years ago, stressed that development meant more than just the flow of hard currencies into certain lands, and more than the distribution of technical know-how. Freedom was, among other things, he said, "the right to share responsibilities" and provided an intellectual and moral challenge which the West must meet successfully if the countries in question were to develop in other than a totalitarian direction.

ECONOMIC QUESTIONS

Mr. Leo Cherne, a director of the Research Institute of America and rapporteur for the panel on the economic and social aspects of East-West tensions, reported that his panel had discussed European institutions, the countries in the process of industrial development, and East-West trade. He said that the panel had stressed the importance of patience in the development of the institutions, that the underlying wish for political integration must be seen in such institutions as the Common Market, and the wisdom of a final merger of the "sixes and sevens." German delegates had assured the Americans that U.S. anxiety over increased discrimination as European institutions developed was unwarranted.

In reference to aid for developing countries the group had been fortunate in the presence at the meetings of Senator Monroney the author of the plan for the International Development Association recently called into being at the meeting of the World Bank of Washington. Senator Monroney again stated the essentials of the new agency for the benefit of the entire group. He stressed the feeling that a new approach was needed—international action with long-term financing, lower interest rates, and second mortgages.

Concerning East-West trade, a reduction of the U.S. embargo list had been urged by some of the delegates, in the hope that such a move might weaken the link between the U.S.S.R. and Communist China. It was also felt that a central agency was needed to counteract Soviet trade moves, and the importance of Western cooperation in this sphere was stressed. The flow of capital investment into Berlin in the last year, since the November 27 threat to Berlin by Mr. Khrushchev, was taken by the panel as an indication of the West's total confidence in the courage of the Berliners and the economic vitality of their city.

Following this final session the conference came to an end, and the American group flew that afternoon to Berlin, where they were to spend 2 days seeing the city's situation for themselves. The delegates came away from the conference with the feeling that it had been, as Mr. McCloy had said earlier, "eminently worthwhile" and it is hoped now that a start has been made to continue regular discussions of this frank and off-the-record sort in future.

Sincerely yours,

Dr. WALTER STAHL.

Representative Victor L. Anfuso (Democrat, New York) said at a Columbus Day celebration in Palermo, Sicily:

"CALL FOR CLOSER UNITY AMONG NATIONS OF FREE WORLD IN SPACE RACE—ADMITS UNITED STATES BEHIND RUSSIA IN SPACE PROJECTS BUT REAFFIRMS SUPERIOR OVERALL STRENGTH OF UNITED STATES—THE THREAT OF COMMUNISM WILL ALWAYS EXIST AS LONG AS ITS POLICY IS WORLD SUBVERSION AND IT FAILS TO RECOGNIZE THE FREE AND INDEPENDENT ASPIRATIONS OF ALL NATIONS—UNITED STATES WILL NEVER RELAX ITS GUARD AND WILL SUPPORT ITS ALLIES TO THE FULLEST

"Columbus risked his life and the lives of his men through unchartered seas to find a new world, which has been a boon to all mankind. Man has most recently discovered still a newer world, many times the size of the world Columbus discovered—a larger world of unexplored horizons. True, we have opened the door to 'the heavens' pathless way,' but the questions now being asked are these: Are we challenging God by these aspirations? Will what we find there be good or evil? Are we getting nearer to the day of destruction?

"In my opinion, we can never begin to challenge God, because what we are seeking to discover He created, millions and millions of years ago. Whether or not it will be a boon to humanity is entirely up to us.

"As chairman of the House Subcommittee on International Cooperation and Security, I have recently traveled extensively throughout Europe, visiting such countries as England, Ireland, Austria, and Germany. Naturally, my most important step in Europe is Italy and Sicily, which I have visited many times before. After all, Sicily is the land of my birth, and I cannot detach the love and affection which I feel for its people.

"Why haven't we beaten the Russians? In the first place, the Russians started on this type of experiment some years before us; and in the second place, we are never out to beat anyone just for the sake of beating them. We have many firsts, and lead the world in so many things that there is no question of our further advancement. There is no question also of our superior military strength. We could wipe the Russians off the map of this world if they started a nuclear or missile war.

"But our goal is to seek the peaceful uses of all these inventions, and cooperation in outer space, so that we can further enrich this world of ours, providing plenty for all. Just like Columbus united East and West, discoveries in the world beyond can unite all the peoples of the earth to seek new worlds as one planetary group, called earthmen.

"This is no fantasy. We already know that we can regulate the weather by bringing rain to desert land, thus making it fertile. We also know that satellite communication can give us all the benefit of worldwide radio and television, whether we are on the farms or in the cities. You here in Sicily, for example, from this public square, and even from your own homes, someday not so far away, can see and hear what is going on in America, Africa, Asia, and anywhere else in the world; and still later on, what is going on on the Moon, Mars, Venus, and other planets of the universe. I don't know whether this would be a good way to solve your emigration problems. I suspect that you would rather come to America and join your many relatives and friends. Frankly, I would like to see as many of you come to America as possible, and you know that ever since I have been in Congress, and long before that, I worked hard to bring about changes in the law making all this possible.

"But we must never despair. Technological developments may make you want to stay right here, and have all the things you are seeking for happiness and security brought directly to you.

"The question arises: Shall we seek those things as free men, or as slaves? If I know the Sicilian temperament, you could never stand bondage of any type.

"I have always wondered, however, how it was possible that in a country where its people are pious Catholics and devoted to the Pope, there could exist the second largest Communist Party in the entire world (approximately 2 million members). It is that the people are turning away from God and accepting an atheistic philosophy? Not at all. The Italian people are no more communistic than the people of the United States.

"Where, then, lies the trouble? You hear many things: that huge monopolies and cartels grip all life in most countries of Europe. If this is true, it is undemocratic, and there must be not only more production, but a more even distribution of the wealth of Italy and Sicily. But, for God's sake, don't turn to communism.

"You know that the basic difference between democracy, as practiced in the United States and communism, is that in a Communist form of government both life and property are owned and controlled by the state. In a democracy, the people have equal opportunity in all endeavors, and government exists only to foster the will of the people. You should continue to strive for a democratic form of government.

"You should have public officials of the type of your great Senator Girolamo Messeri, who is a dedicated Italian and, above all, a dedicated Sicilian, who knows the problems of the world and is highly regarded in America because of his long service and experience there.

"Senator Messeri learned a long time ago that elected officials should owe their allegiance to the people who elected them, and to no one else. He learned, too, that public officials must be ever mindful, as we say in America, of the needs of the people, and to transform their will into action. Public office, as we often say in America, is a public trust, and not just an 8-hour-a-day job. Monopolies and cartels are not tolerated in the United States, and are prosecuted vigorously by our Department of Justice. Why, only the other day, the courts of the United States, following a prosecution by the Department of Justice, ruled that the Du Pont Corp., which largely deals in chemicals, must give up all influence in the General Motors Corp., dealing in automobiles. It did this by flatly deciding that the Du Pont Corp. could not vote its $3 billion holdings in the General Motors Corp. You should look and see whether a similar ruling could by made by the courts of Italy. I think not.

"You will never have a government anywhere near that of the United States, and in spite of the religious fervor of your people you will never stop the cancerous growth of communism unless you establish and enforce antitrust laws.

"It would seem to me that all Italians, particularly those who have amassed great wealth in Italy and stand a chance of having it confiscated from them by a Communist form of government, would be the first to realize the danger which grips not only Italy but the entire world today. It would seem to me that these people would be the first to offer to pay more taxes to lessen the burden of the common people, to relieve unemployment, and make an even greater contribution to win the cold war against the Communists. It would do them no good to play both sides against the middle by making financial contributions to the Communists. Come the revolution, they will be just ordinary comrades, if they survive at all. My guess is that they will end up in concentration camps. We must all realize that the threat of communism will always exist as long as its policy is world subversion and it fails to recognize the free and independent aspirations of all nations. For this reason, the United States will never relax its guard, and will support its allies to the fullest.

"I have no fear that the world is going to be destroyed by a missile or an atomic war. Both sides have today developed missiles and weapons capable of destroying each other in such a conflict.

"I do not wish to imply that your country and my country must not continue to strengthen our defenses and our capacity to resist an all-out attack, because that would only invite aggression. Our enemy will recognize and respect our strength, and not our weakness.

"But our enemy also knows that she need not engage us in an open conflict to defeat us. She has already involved us in an economic cold war which we could lose, if we do not alter the method of waging it. This economic war can be compared to a cancerous disease which slowly destroys the human body, and is just as deadly as a bullet to the heart.

"I would rather that our foreign aid be more directed to training the youth of the free world in science, mathematics, engineering, and other technologies needed to match the growing strength of the Russians in this field. If necessary, we should give a stipend to those interested in science who pass competitive examinations, in order that they may continue their studies.

"I would strongly recommend that my Government and your government appoint a science and economics team, of not more than 10 on each side, and composed of our Ambassador here and experts from both countries in the fields of science, technological developments, engineering, and economy. Of course there must be some Sicilians on this committee. This team should work together constantly on opposite sides of the table and in the field, studying ways and means of strengthening both countries, calling a spade a spade, in order to make the United States and Italy a working partnership. This should be done with all of our allies.

"Whoever controls the field that I have talked about will also control production and supply of consumer goods. You have already seen what technological

developments have done for Sicily and for Italy in a limited sense. Imagine what they can do for all of you in an all-out effort.

"Control of this field in Communist hands, with the billions of people under their domination, will prove just as deadly to the free world as a missile or atomic attack.

"We need not lose this economic war if we take precautions now, and sacrifice a little of our good living, that is, those who have it—and certainly not many of you Sicilians, who barely have what it takes to live—and invest it in our future. At the present time we are drawing on our future, while the Communists are investing in it by depriving themselves of luxuries today.

"We can win such a conflict as free men, or lose it and become slaves to a system which makes no distinction between life and property.

"I wish to conclude that what I have said was not meant as carping toward this country or any group or individual, but rather as constructive suggestions, the kind of suggestions one gives when speaking about people and things he loves and holds dearly. As I said before, I was born here, and still have two sisters living here, with dozens of cousins. What I wish for them, I wish for all of Italy."

NATO Scientific and Technical Cooperation

(By Norman F. Ramsay, scientific adviser to the Secretary General)

The NATO Science Committee and the Office of the Science Adviser were established only a year ago. In the communique of the heads of governments in December 1957, it was stated that "the full development of our science and technology is essential to the culture, to the economy, and to the political and military strength of the Atlantic Community." To this end, they advised the creation of a NATO Science Committee and an Office of the Science Adviser. These are now in full operation.

PURE AND APPLIED SCIENCE

The Science Committee has studied means for strengthening science among the NATO nations and has taken steps to do so.

The largest and perhaps most obvious of these actions is the NATO fellowship program. Since the end of the war there has been an unsatisfied need for more freedom of movement for scientists both within Europe and reciprocally between Europe and America; in other words, a need to increase the direct knowledge of what other and distant research workers were doing. There has also been a shortage of well-trained scientists. The North Atlantic Council at the recommendation of the Science Committee has now established about 250 science fellowships for use in countries other than that where the applicant lives, and it is hoped that this number will rise to about 400 next year.

A less obvious proposal, but one that may give even quicker results, is the encouragement of institutes and summer schools for the study of advanced or special scientific topics. There have in the past been two successful examples of these in Europe, at Les Houches and Varenna, where both young and experienced scientists of high caliber discuss together and lecture on chosen subjects of vital scientific interest. NATO has now established a fund for the partial support of such institutes. Largely as the result of the NATO support, there will be six institutes next summer and even more in subsequent years.

The heads of governments communique also stated that "we seek to increase the effectiveness of national efforts through the pooling of scientific facilities and information and the sharing of our tasks." There are a number of ways in which it is foreseen and hoped that this effectiveness can be attained. A direct way is that of undertaking collaborative efforts, and three of these under present discussion are deep-sea oceanography, space exploration, and materials research. Cooperation in these fields of research is essential. For example, deep-sea oceanographic research ships are too expensive for most NATO nations separately but not collectively. Furthermore, even with separate ships, coordinated studies are more meaningful than separate ones. The number of important scientific questions that could be studied in this way is large.

Another means by which NATO science might be helped forward on a cooperative basis would be by a comparatively small fund available to support cooperative scientific projects which are held up because of lack of funds. For example, sometimes it will be that a project is short of special equipment which can only

be bought with foreign currency. A fund, quickly available to those who need help, is many times more valuable, price for price, than money that is laborious and slow to administer. It is hoped that a fund may soon be made available with these characteristics of speed of administration and flexibility.

DEFENSE RESEARCH

The field of defense science is of obvious importance. But defense research cooperation is often slowed down by secrecy. Secrecy is a necessary element but it has greatly inhibited cooperation in defense research. However, during the past year there has been spectacular improvement in the exchange of classified defense research information. The launching of the Russian Sputnik showed both that the NATO nations could not afford such a waste of scientific effort and that the Russians had probably already discovered much of the information that the NATO nations were so zealously guarding from each other.

Cooperation in defense research has greatly increased during the past year. This increased cooperation has taken place among different small groups of NATO nations with common defense research problems. However, some research has also taken place at NATO defense research centers such as that for research on air defense. A new cooperative research center to study the important and difficult problems of submarine detection is now being established.

CONCLUSION

The problem of science in the Atlantic Community remains a challenge. Much has been done by national efforts and by international enterprise. Compared to the past, the scientific and technical cooperation now existing among the NATO nations is impressive. Yet, compared to what is needed to be done, when we think of the swift advance of Russian research—even if Russia has yet to catch up with the West in most subjects—then our efforts are still too slow footed. The present is a beginning but the challenge still remains.

TRAINING CENTER FOR EXPERIMENTAL AERODYNAMICS, RHODE-SAINT-GENÈSE, BELGIUM

The major activity of the Training Center for Experimental Aerodynamics is instruction; this instruction is in experimental aerodynamics (the only theoretical lectures given are the minimum considered necessary to provide a proper background to the experimental program) and the course work is essentially postgraduate (a minimum qualification is a master's degree from a university in the United States or a broadly comparable qualification for graduates of other countries). The center is already very well equipped and when all the facilities (listed below) are operational, they will make the center one of the best-equipped educational institutes in this field.

The advantage to those smaller countries of NATO whose universities are relatively ill equipped is obvious. Students from these countries join the center with a very poor background in experimental aerodynamics although they are usually first-class theoreticians. For such students (and from fig. 1, it is clear that the center has been well attended by the smaller countries) the 9-month course at the center provides an essential complement to the graduate studies given at their home universities. Without the center's course these men could not obtain the training required for doing a fully effective job in research or development, and there can be no doubt that there exists an urgent requirement for the NATO nations to increase its trained scientific manpower.

Although the advantages of the center to the countries whose own aerodynamics facilities are well developed are less obvious, they are in fact very real. Referring again to figure 1, countries such as France, Germany, the United Kingdom, and the United States have between them sent students in considerable numbers to the center. The response so far from the United States has been less strong than from the others but this is almost certainly due to our being less well known there. This situation now appears to be changing, as we have for the year 1959–60 received a record number of applicants (8) from the United States; all of these appear to be qualified for the course and two of them outstandingly so.

Although students from these countries have already had some experience in experimental aerodynamics, the university curriculums are invariably predominantly theoretical in character and the experimental program occupies a relatively small portion of the total time and tends to aim at illustrating theoretical

conclusions. In contrast, the center endeavors to give its instruction in the atmosphere of a working laboratory, teaching students to use the equipment and exposing them to the type of problem encountered in normal experimental research. Young scientists normally learn this aspect of their craft on the job after they have graduated. With the many new developments of the past few years, this is rapidly becoming an expensive and unsatisfactory method of training: expensive because at the training stage the young graduate demands, without much useful work in return, the attention of a responsible man at what is probably the most creative stage of his career, and unsatisfactory because the instruction tends to be haphazard and limited to the particular job in hand.

This point of view appears to be shared by some aircraft firms. One firm in the United Kingdom has indicated its wish each year to send one of its young engineers, paying his salary at the center. A man of a few years' postgraduate experience was sent in 1958–59 and another has been entered for 1959–60. Following a visit by senior scientists from the firm, Chance Vought Aircraft is making a similar arrangement for one of its young employees. These firms have indicated their willingness to lose the services of men of 1 or 2 years' experience to attend the center's course, the firms paying cost of transport and salary.

It is perhaps significant that firms who have sent students usually continue to do so but the center finds it relatively hard to "break into" an organization with which it has had no previous business.

In addition to the direct advantage of providing technical training to individual students, there is the less readily assessable but very real gain in stimulating cooperation between working scientists and engineers of NATO countries. At the center, students work together in small groups and the general rule is to avoid putting two students from the same country in the same group. Those students, in particular, who later rise to positions of prominence in their own countries, will undoubtedly be helped by having studied in an atmosphere of international collaboration. Not all the students will achieve positions of prominence but at least one has—the recently appointed head of the Aerodynamics Laboratory at Copenhagen is an ex-student.

The center is still a new and growing institute. It began in 1956 at the initiative of the Advisory Group for Aeronautical Research and Development, mainly as a result of the personal enthusiasm of Professor von Karman. Figure 2 shows the three organizations directly concerned with its creation. An agreement was signed between the Belgian Ministry of Communications and the mutual weapons development program of the United States under which the Belgian Government agreed to lease the buildings and equipment free of charge, maintain them in an efficient state, and, in addition, pay 36.57 percent of the running costs of operating the center (MWDP paying 63.43 percent) for an initial trial period, originally fixed on 2 years, but later amended to 3 years, and ending on September 30, 1959. Figure 3 illustrates this arrangement and also shows that, in addition, some support (relatively small) has come from other sources as contributions to the fellowship fund (which meets the traveling and cost-of-living expenses of students) and also as contracts for research investigations made by staff of the center.

In July, the Permanent Council of NATO decided that the countries of NATO who wish to send students to the center should provide financial support previously provided by MWDP. The governments who have promised support for the 2-year period 1959–61, are shown in figure 4. Belgium will continue to loan and maintain the buildings free of charge and will also meet a large portion of the operating costs.

In the period 1956–59, the center's budget has averaged 10,750,000 francs per year ($215,000). This includes a sum of about 750,000 francs contributed to the fellowship fund, leaving 10 million francs for the normal operating costs of the center.

Under the NATO agreement, the budget has been fixed at 12,770,000 francs per year with no provision for transfer to the fellowship fund. Of this sum, 6 million is to be contributed by the Belgian Government and 24.2 percent (3,092,000 francs)—the normal NATO cost-shaving formula—from the United States.

These totals (10 million francs and 12,770,000 francs) which correspond respectively to an average of 15 students for 1956–59 and of 23 for 1959–61, are not large considering the scope of the center's activities. An experimental program of the type conducted at the center, requires a substantial supporting effort, both technical and administrative. Figure 5 shows the organization built up to support the academic and research programs.

In addition to the 9-month course, the center has recently started a course of 3 weeks in applied electronics. It is hoped to add other short courses as soon as

the required resources can be built up. The center has proved to be a very convenient place for holding international conferences. The main conference room holds 130 and is equipped for simultaneous translation in 3 channels.

FACILITIES

Figure 6 shows a plan of the major used tunnel and other facilities at the center. Brief details of size and performance are given below.

The aim of the center is to have a wide variety of up-to-date experimental facilities covering as far as possible the full range of interest in aerodynamics. In this way, the academic program can be arranged to include a wide variety of laboratory work giving students experience in the various techniques which they are likely to encounter in research and development organizations. This equipment allows the center to undertake a useful volume of research in areas of current interest. Although the major activity of the center will be directed toward its primary aim of teaching experimental aerodynamics, it is considered necessary, if this is to be well done, also to undertake a lively research program.

Briefly, the facilities include wind tunnels covering the range from low speeds to hypersonic, equipment to study problems of internal aerodynamics, shock tubes and instrumentation associated with this equipment.

The facilities which existed when the TCEA was created in 1956, comprise the two largest tunnels listed below, namely, the Esscher-Wyss composite low-speed tunnel and the Brown-Boverie continuous supersonic wind tunnel.

The U.S. authorities have assisted in many ways in building up the facilities to the present stage. The NASA Langley Research Center assisted in the design and manufacture at TCEA of the transonic test section to the Brown-Boveri Tunnel. The cascade tunnels and associated equipment were previously in operation at the Langley Research Center and were made available to the TCEA by the NASA and the U.S. Air Force. The U.S. Navy made available to the center the complete 5 by 5 inch test section (no longer in use at the Naval Ordnance Laboratory) for incorporation in the hypersonic wind tunnel which has been designed at the center and which is being built with U.S. funds administered by the European office of ARDC.

Low-speed wind tunnels

The Escher-Wyss composite low-speed wind tunnel (L–1) is of unusual design. It can be used either as an open-jet tunnel of 3 meters diameter, with an airspeed of 60 meters per second, or as a closed jet tunnel of 2 meters diameter and 110 meters per second speed or as a vertical jet, for spin testing, of 3 meters diameter and 30 meters per second speed. The contrarotating fans of this tunnel are driven by an 850 kilowatt d.c. motor.

The 30 centimeter low-speed closed-jet wind tunnel (L–2) has an open circuit but is essentially a one-seventh scale model of the composite tunnel in its closed-jet configuration. It is driven by a 6 horsepower d.c. motor and can be operated at speeds up to 60 meters per second.

The 15 centimeter low-speed open-jet wind tunnel (L–3) has a closed circuit and is one-fourteenth scale model of the composite tunnel in its open-jet configuration. This tunnel has a maximum speed of 8 meters per second and is used for low-speed instrumentation work (e.g., hot-wire anemometry).

The 20 centimeter low-speed closed-jet wind tunnel (L–4) has an open circuit and is driven by an axial compressor powered by 75 horsepower d.c. motor. This tunnel, which has a maximum speed of 120 meters per second, is mainly used for the development and calibration of flow-survey instruments.

Supersonic tunnels

The Brown-Boveri 40 by 40 centimeters continuous supersonic wind tunnel (S–1) is of the Ackeret type and can be operated at mach numbers up to 2.5, with a square test section 40 by 40 centimeters. It is driven by a 13-stage axial-flow compressor and is equipped, in its return circuit, with a silica gel dryer. A Schlieren system is provided for flow observations.

An alternative transonic test section to the 40 by 40 centimeter supersonic wind tunnel was completed in early 1958. It features a slotted wall 40 by 40 centimeter square test area, and covers a speed range from approximately a mach number of 0.5 to 1.2 at stagnation pressures of about 0.5 atmosphere.

The 1.5 by 1.5 centimeter continuous supersonic wind tunnel (S–2), fitted with a mach 2.2 nozzle is operated as a nonreturn tunnel taking in atmospheric air through the dryer of the 40 by 40 centimeter tunnel using the latter's evacuating

pump for the drive. This tunnel is provided with an independent Schlieren system.

The 5 by 6 centimeter blow-down supersonic wind tunnel (S–3) is now being installed. This tunnel is fitted with a mach 2.75 nozzle and has a running time of 45 seconds which will later be increased to 3 minutes.

The composite blow-down wind tunnel (S–4) has alternative sections of 20 by 40 centimeters for subsonic operation and 20 by 20 centimeters with a sliding block nozzle, covering the mach number range 1.3 to 2.7.

Cascade tunnels and associated equipment

The 12 by 50 centimeter continuous subsonic cascade tunnel (C–1) is driven by a centrifugal blower and has a maximum speed of 40 meters per second. The tunnel is equipped with porous sidewalls for boundary layer removal and is mainly used for the two-dimensional study of blade sections in cascade.

The 18 by 50 centimeter transonic cascade tunnel (C–2) will be installed as soon as necessary modifications are made. This tunnel, which will be induction driven, will cover a range of mach number from 0.3 to 1.2. It is equipped with alternative porous walls for boundary-layer removal and glass sidewalls for Schlieren. It will be used for the study of the design of high-speed compressors and turbines.

The 13 by 25 centimeter supersonic blow-down cascade tunnel (C–3) is equipped with asymetrical nozzle blocks for mach numbers 1.5, 1.8, 2, and 2.25. The running time of this tunnel is about 1½ minutes, and provision is made for use of Schlieren apparatus. The tunnel will be used for investigation of compressor and turbine blades at supersonic speeds.

The low-speed test blower (R–1) has a rotor tip diameter of 70 centimeters, a hub diameter of 56 centimeters and a maximum tip-speed of 135 meters per second. It has atmospheric inlet and discharge, and is driven by a 75 horsepower d.c. motor. It is used for the study of low-speed rotor performance.

The 250 horsepower compressor test stand (R–2), with a rotor tip diameter of 40 centimeters, rotor hub diameter of 30 centimeters and a maximum speed of 300 meters per second, is a closed circuit apparatus, which can be used with air at various pressures and with gases other than air. It is driven by a d.c. dynamometer motor. It is used for studies on axial compressor stators and rotors.

Hypersonic tunnels

A hypersonic tunnel (H–1) to cover the speed range from mach No. 4 to approximately 8 using air at a temperature of 900° F. has been designed at the center and is expected to be built and installed by the end of 1960. The test section is 30 by 30 centimeters and will be driven by the same high-pressure air supply as is used for the blow-down supersonic tunnels.

A second small hypersonic blow-down wind tunnel (H–2) has been designed and it is expected that construction will be completed in the next few months.

Center's graduates by nations, 3-year period 1956–59

Belgium	3	Norway	2
Denmark	4	Turkey	2
France	3	United Kingdom	7
Germany	6	United States	3
Greece	5		
Italy	6	Total	45
Netherlands	4		

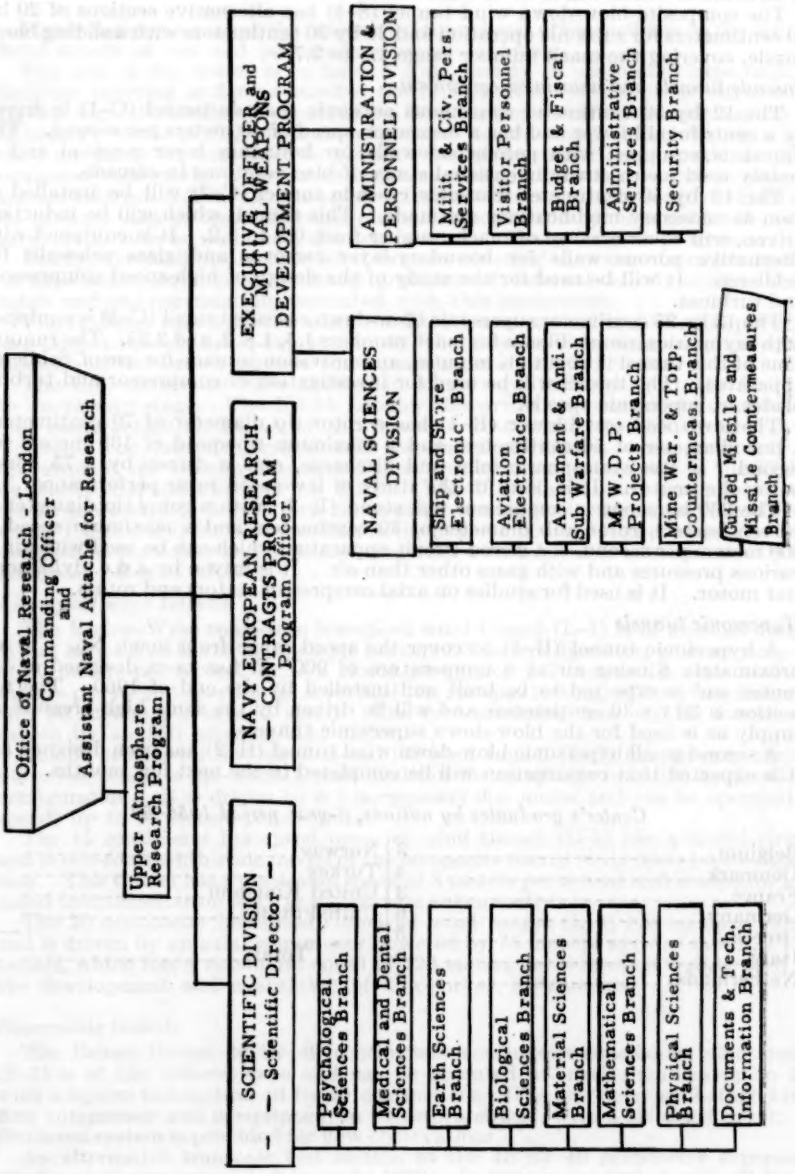
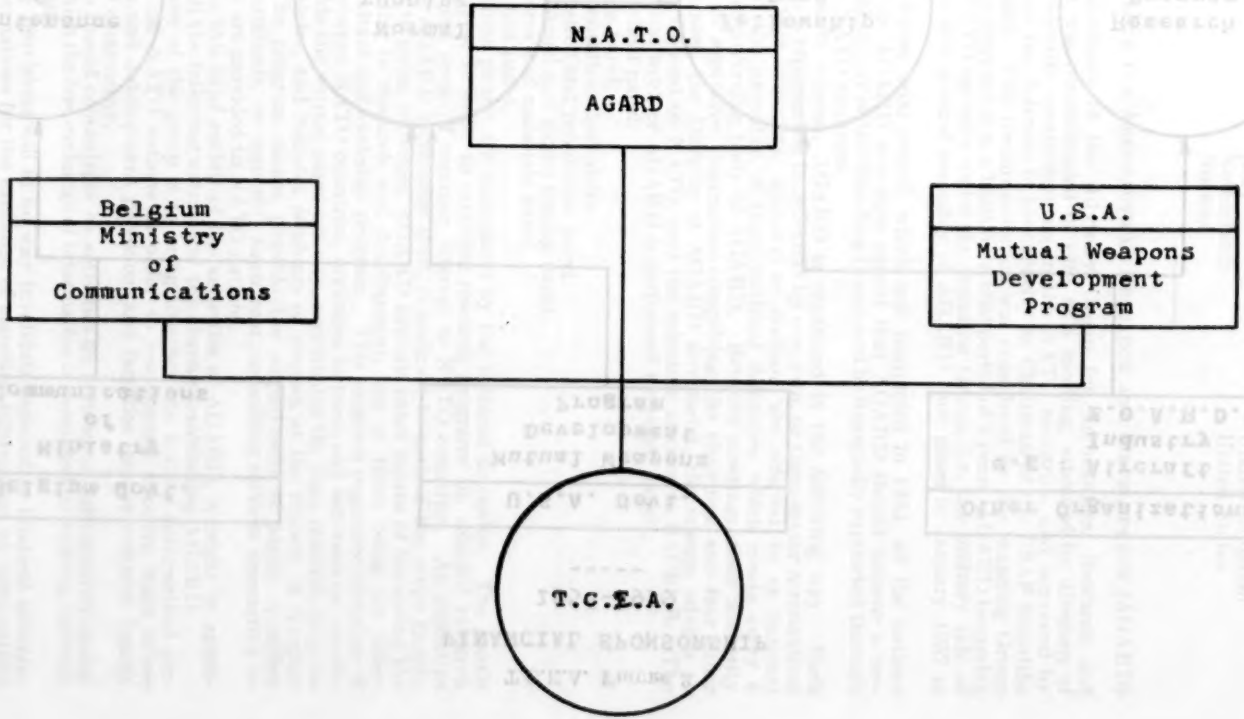

Office of Naval Research - London
Commanding Officer
and
Assistant Naval Attache for Research
Upper Atmosphere Research Program
NAVY EUROPEAN RESEARCH
— CONTRACTS PROGRAM —
Program Officer
SCIENTIFIC DIVISION
— — Scientific Director — —
Psychological Sciences Branch
Medical and Dental Sciences Branch
Earth Sciences Branch
Biological Sciences Branch
Material Sciences Branch
Mathematical Sciences Branch
Physical Sciences Branch
Documents & Tech. Information Branch
EXECUTIVE OFFICER and
MUTUAL WEAPONS
DEVELOPMENT PROGRAM
ADMINISTRATION & PERSONNEL DIVISION
Milit. & Civ. Pers. Services Branch
Visitor Personnel Branch
Budget & Fiscal Branch
Administrative Services Branch
Security Branch
NAVAL SCIENCES DIVISION
Ship and Shore Electronic Branch
Aviation Electronics Branch
Armament & Anti-Sub Warfare Branch
M. W. D. P. Projects Branch
Mine War. & Torp. Countermeas. Branch
Guided Missile and Missile Countermeasures Branch

FIGURE 1

T.C.E.A. FIGURE 2
FOUNDING FATHERS



T.C.E.A. FIGURE 3

FINANCIAL SPONSORSHIP

1956-1959

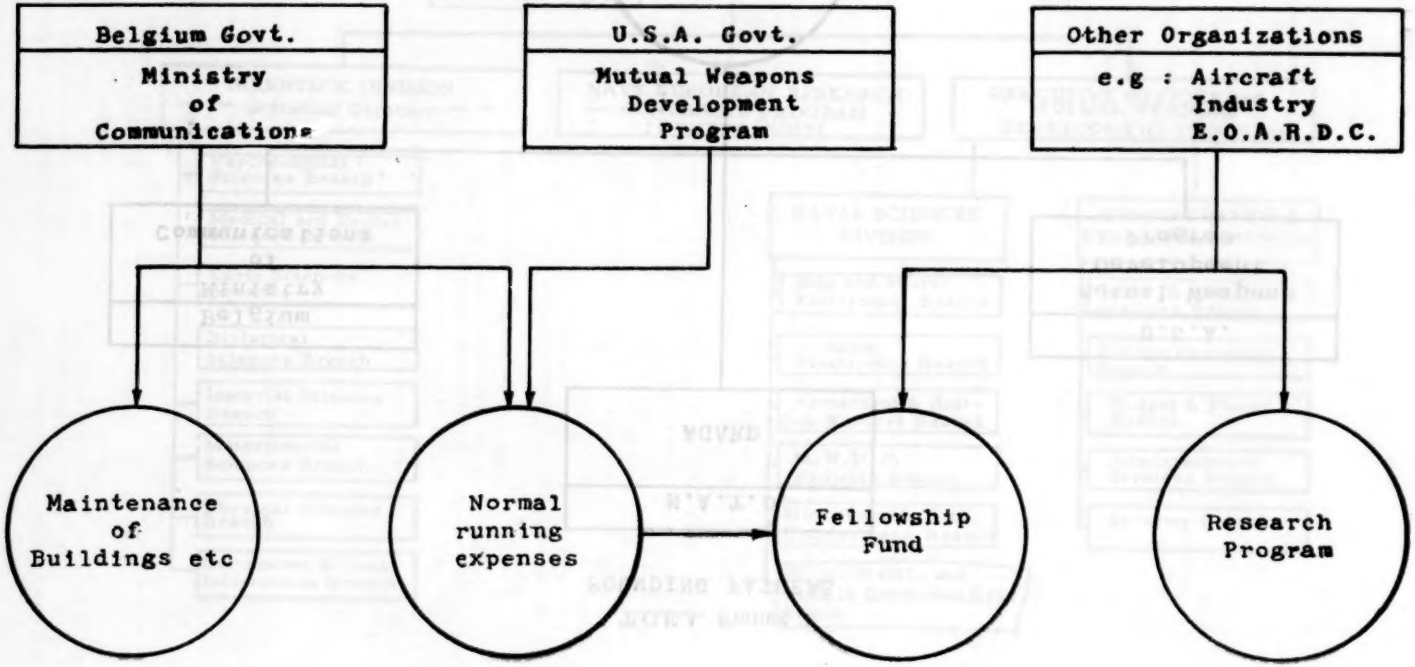


FIGURE 4.—*Nations promising support, 1959–61*

Belgium	Greece	Turkey
Canada	Italy	United Kingdom
France	Netherlands	United States
Germany	Norway	

ADVISORY GROUP FOR AERONAUTICAL RESEARCH AND DEVELOPMENT (AGARD)

The establishment of the Advisory Group for Aeronautical Research and Development was recommended in 1951 at a meeting, attended by directors of the various scientific establishments in the NATO countries, and convened by Prof. Theodore von Kármán in his capacity as Chairman of the USAF Scientific Advisory Board. This recommendation was considered by the Standing Group of NATO who accepted it as a basis for a trial period of 2 years, AGARD becoming one of the NATO agencies under the Standing Group, i.e. the military side of NATO. The first general assembly of AGARD took place in January 1952 in Paris.

After the 2-year trial period, which was completed in 1954, all the nations participating in AGARD activities agreed that AGARD should become a recognized official agency of the Standing Group and be financially supported through international NATO channels.

To perform its mission, AGARD is organized in the following way. Each NATO nation is represented in AGARD by one, two, or three senior aeronautical scientists. These scientists, military or civilian, are referred to as national delegates and the assembly of these national delegates, which meets every 6 months, is the governing body of AGARD. Between meetings, their authority is vested in an executive Committee comprising the chairman and four other national delegates, the Director of AGARD secretariat, the science adviser to the Secretary General of NATO, and the scientific adviser to SACEUR. The detailed technical work of AGARD is performed by seven panels:

Aeromedical panel.
Avionics panel.
Documentation Committee.
Combustion and propulsion panel.
Wind tunnel and model testing panel.
Structures and materials panel.
Flight test panel.

Members of these panels are nominated by the national delegates. The panels meet twice a year in order to establish research programs on selected research and development areas of common interest to NATO countries. An executive officer, on the AGARD secretariat staff, is assigned to each of the seven panels.

In addition to panel activities, AGARD exploits other means of increasing the NATO potential in research and development, one of these being the international consultant and exchange program. This program organizes exchange of researchers between NATO countries, organizes lectures and seminars on specific subjects outside the normal panel activity, coordinates the joint research projects between countries, and initiates seminars or courses at the request of member countries. The program makes possible the employment of highly qualified experts as consultants, on request. Each year, consulting services amounting to 800 man-days are provided to NATO nations.

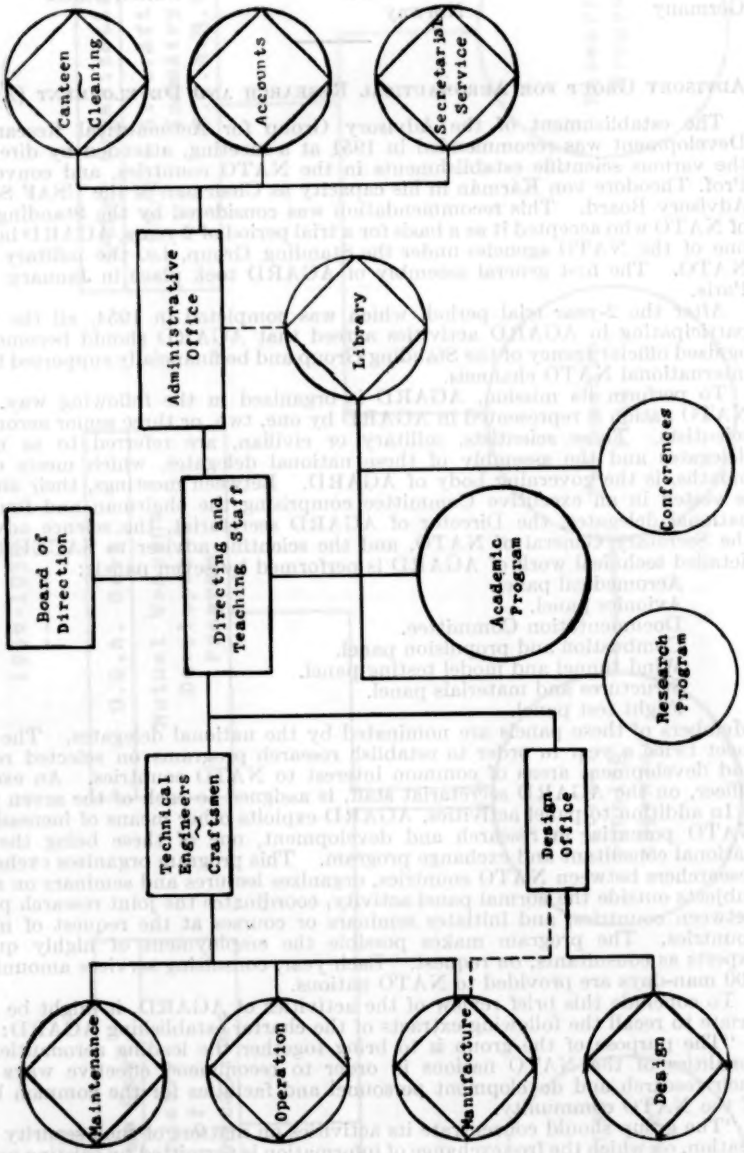
To conclude this brief review of the activities of AGARD, it might be appropriate to recall the following extracts of the charter establishing AGARD:

"The purpose of the group is to bring together the leading aeronautical personalities of the NATO nations in order to recommend effective ways to use their research and development personnel and facilities for the common benefit of the NATO community.

"The group should concentrate its activities on matters of such security classification, on which the free exchange of information is permitted by existing national security policies.

"The above provisions will in no way invalidate regional or bilateral arrangements between nations for the exchange of classified information on aeronautical research and development."

The list of the national delegates representing each NATO country is given below, as well as the list of the executive committee of AGARD.



T.C.E.A. FIGURE 5

NATIONAL DELEGATES

Theodore von Kármán (United States), Chairman

Belgium:
M. Freson
F. Haus
Canada:
J. J. Green
D. C. MacPhail
Denmark: P. N. Brandt-Moeller
France:
J. Peres
M. Roy
M. Wanner
Germany:
T. Benecke
A. W. Quick
Greece: N. Papadimitriou
Italy:
C. Alippi
G. Gabrielli
Netherlands:
H. J. van der Maas
A. J. Marx
Norway: S. Heglund
Portugal: B. Delgado
Turkey: F. Ulug
United Kingdom:
W. Cawood
W. S. Farren
E. T. Jones
United States: H. L. Dryden

EXECUTIVE COMMITTEE

T. von Kármán, Chairman

P. N. Brandt-Moeller
G. Gabrielli
E. T. Jones
M. Roy
F. L. Wattendorf, director
K. C. Black, scientific adviser to SACEUR
F. Seitz, science adviser to the Secretary General

Office of Naval Research, London

1. BACKGROUND AND MISSION

ONR London is a reflection of Navy leadership in postwar American science. By agreement with Dr. Vannevar Bush, the Navy took over the London liaison offices of the Office of Scientific Research and Development (OSRD). Upon termination of OSRD, the Office of Research and Inventions—now ONR—assumed the operation of that Office and remodeled its role to Navy needs.

The activities of ONR London begin with fundamental research and extend into the area of technological development as related to naval equipment and operations and provide some modest support for actual research and development in European laboratories. As shown in figure 1, three areas are involved: scientific liaison, mutual weapons development program, and Navy European contracts research program.

2. SCIENTIFIC LIAISON

As restated in SECNAV notice 5450 of August 15, 1953, the mission of the Office of Naval Research, London, is to "establish and maintain scientific liaison with all scientific research agencies in the area in order to keep the Navy Department, and especially the Chief of Naval Research, informed of all scientific endeavor in the United Kingdom and on the Continent."

ONR London is the only U.S. Government agency engaged in absolute scientific liaison and strangely will probably never be emulated. The State Department disclaims interest in technical reporting per se. The Air Force and Army approach the problem along different lines. The answer seems to be that the Navy's technological base not only requires such immediate liaison but nurtures an environment from which such a fine corps of scientific liaison officers may spring. It is interesting to find that American industry has copied the Navy's program. These industry liaison groups are informally organized and a listing is attached.

A. Information flow to the United States

The Office forces a continuous and effective flow of European scientific information to the United States and vice versa. Such information is obtained by ONR London staff members through (1) direct personal contact of ONR London scientists with their counterparts in the laboratories of European universities, government establishments, and industries, and (2) coverage of scientific meetings, not only international symposia and scientific society meetings but specially called ad hoc meetings, and informal group discussions.

Scientific information thus acquired is immediately incorporated into reports and transmitted to ONR, Washington, to research contractors, scientists, and other Government agencies or organizations. Periodically the London liaison officers return to the United States to relate their findings directly to ONR, Washington, and to American scientific groups working for the Navy. The formal reports prepared by staff members are as follows:

(i) European Scientific Notes (ESN), published monthly, distribution of approximately 4,000 copies. ESN's have proven to be a fruitful source for broadcasting scientific achievements from abroad and are uniformly lauded by their recipients. In 1956 a survey was made to assess the worth of this medium in relation to normal channels for scientific communication, i.e., in view of the reestablished "nominal" flow via journals to visits of working scientists to international conferences. It was found that due to multiplication of scientific effort since World War II, the present flood of scientific information required the new liaison medium, particularly ESN.

(ii) Technical reports are designed to give more detailed information on progress in some area of a scientific field and are generally concerned with the interests of specialists in that area. These reports, numbering about 150 per year (each with a distribution of between 250–500 per report) are referenced in the ESN's and are the subject of over several thousand requests per year. Each scientist has a distribution list of several hundred recipients for each report. These reports frequently assess the overall research capability of a given European country in a particular scientific field.

(iii) Technical memoranda direct information of specific interest to a small group of specialists in a given area as well as fulfill specific requests of one of Navy technical groups or a contractor. Approximately 50 of these memoranda are issued annually.

(iv) Letters treat specific inquiries from individual scientists, especially within ONR and the Navy laboratories.

B. Information flow to Europe

Of equal importance is the flow of scientific information from the United States to Europe. Research reports written by Navy contractors and in-house laboratories from the Office of Naval Research and a number of government agencies are made available to ONR, London. These reports frequently contain prepublication information in scientific journals by as much as a year. During a single year, over 40,000 individual copies of reports were distributed to European scientists. The office is approached for films, addresses, biographies of American scientists, etc.—all sorts of questions of a scientific nature are received. For example, following Sputnik, it was besieged for information on the American satellite program.

The European scientists also request and are supplied specific reports from ONR, London. Approximately 300 requests for reports from ONR, London, were received and filled last year.

C. Assisting visiting scientists

ONR, London, provides a valuable and timesaving service to Navy scientists in their visits to European scientists and laboratories. Having direct contact with European research and development activities, the Office recommends itineraries to meet the needs on an individual basis. The professional nature and influence of the preliminary contact cannot be overestimated. ONR, London, is widely acclaimed by visiting scientists as a primary factor in assuring smooth and effective personal contacts between United States and European scientists. Similar and even more important services are frequently provided for European scientists who are intending to visit the United States.

D. Scientific liaison officer

Although personal visits abroad and sabbaticals spent working in the laboratory of a colleague accomplish direct contact, only a limited number of scientists are served by this means. The scientific liaison officer acts as a dynamic third body in creating an effective nexus between scientists and the circuit of information flow. There are attached illustrations proving the direct and indirect value of these officers to contractors, in-shop scientists, and technical administrators of the Department of the Navy, the Department of Defense, and other Government agencies in their scientific activities.

3. MUTUAL WEAPONS DEVELOPMENT PROGRAM

In 1954, in furtherance of the principle of mutual defense assistance among the allied countries, the mutual weapons development program (MWDP) was established. The Chief of Naval Operations is responsible for the overall coordination of the U.S. Navy participation in the program. The Chief of Naval Research is responsible for the technical supervision of all Navy MWDP projects. As his chief agent in Europe, the commanding officer, ONR, London, has been charged with the responsibility for monitoring the progress of approved Navy projects, and in collaboration with the Navy member, mutual weapons development team (MWDT), Paris, determining the requirements for technical assistance and assisting in determining the merits of proposed projects. It is considered that a great deal of the value and successful completion of Navy projects are due to the technical guidance and assistance provided personnel by ONR, London, project officers or by arrangement through them for appropriate expert advice and help.

Seven naval officers serve as project officers of this program.

Through the end of the fiscal year 1958 funds totaling $23.5 million of U.S. funds had been obligated for the projects which the Navy monitors, and $11 million expended.

As part of their responsibility for monitoring the mutual weapons development projects, the officers recommended technical assistance in the form of instrumentation, documents, exchange of visits among technical personnel and the like. During fiscal 1958 some $979,000 of technical assistance funds were obligated by the Navy.

Members of the civilian scientific staff of ONR, London, also assist the project officers by fairly frequent consultations in the office. On occasions where their more specialized training is needed, they accompany project officers on visits to the project. For example, Dr. Dietz and Dr. Albers, recently on the London staff, both followed two projects fairly closely and visited laboratories and personnel engaged on these projects.

This program is still relatively young (1954); however, a number of very promising developments are included in the 15 completed projects. Of particular interest among the 48 active projects in seven countries is the TERNE III system, a complete ASW weapons system, developed by the Norwegian Defence Research Establishment. This weapons system, incorporated in a Norwegian naval ship, underwent limited operational evaluation at Key West. Although the final report of the evaluation has not been received, preliminary results are extremely encouraging. Similar in concept and operation to weapon Able, the TERNE III system can be installed in ships of the DE class and smaller. It is expected that the German Navy and other NATO navies will make significant use of this system.

4. U.S. NAVY EUROPEAN RESEARCH CONTRACTS PROGRAM

By SECNAVNOTICE 3920 of October 22, 1956, the Chief of Naval Research is assigned responsibility for the execution of this program and for its coordination throughout the Navy. SECNAVNOTE 3920 of October 22, 1958, reaffirmed this program for Navy utilization of the scientific and technical potential of Western Europe. Closely coordinated with the European research contracting offices of the Army and Air Force, NERCP relies primarily on ONR, London, for firsthand and accurate information about European scientific capabilities.

As shown in the table below, this program is a modest one:

Countries with NERCP contracts

	Number
Belgium	1
France	2
Germany	8
Italy	2
Norway	1
Switzerland	1
United Kingdom	6
Total (7)	21

Dollar value of contracts

	Number	Value
Navy R. & D. contracts	21	$736,000
Currently active contracts	15	257,500

AMERICAN SCIENTIFIC AND TECHNICAL REPRESENTATIVES IN EUROPE

LABORATORIES

Battelle Memorial Institute; Dr. Frank Croxton, director. Laboratories in Frankfurt and Geneva; laboratory to be established in England. Offices also in Paris, London, Milan, and Madrid.

Union Carbide & Carbon—"European Research Associates," Brussels, Belgium; Dr. Roger Gillette, director.

International Business Machines, Zurich; Dr. Ambros F. Speiser, director.

Radio Corp. of America, Zurich; Dr. A. Rose, director.

Corn Products Refining Co., Milan, Italy.

REPRESENTATIVES

E. W. Cook, American Cyanamid, London.
H. J. Collyer, Cabot Carbon, Ltd., London.
I. Edelenau, Cities Service Oil Co., London.
G. S. Garston, E. I. du Pont de Nemours, London.
H. J. Haon, E. I. du Pont de Nemours, London.
H. Lewis, E. I. du Pont de Nemours, London.
V. E. Henny, Universal Oil Products, London.
A. E. Laurence, Minnesota Mining & Manufacturing Co., London.
P. V. Smith, Esso Research & Development Co., London.
J. Widman, Gemec Chemicals Co., London.
C. Winans, Koppers Co., Frankfurt.
R. J. Davis, Celanese Corp., Duesseldorf.
A. L. Glasebrook, Hercules Powder, Hague.
R. P. Kenney, Goodrich, Hague
P. E. Newman, Scientific Design Co., Paris.
G. Voetelink, Philips Petroleum, Lausanne.
D. S. Weddell, Monsanto Co., Geneva.
J. V. Powell, Oronite Chemical Co., Geneva.
C. P. Roberts, Food Machinery & Chemical Co., Geneva.
R. Voorhees, Union Carbide & Carbon, Geneva.
K. H. Meissner, Consolidated Engineering, Zurich.
H. Hausdorf, Perkin-Elmer, Zurich.
L. Camp, Bendix Aviation, no fixed headquarters.

P.S.—Both Armour Research Institute and Stanford Research Institute have announced plans to provide technical news from Europe for subscribers on a contract basis.

European Office, Air Research and Development Command

This office, inaugurated in 1952, parallels the Navy's London Office of Naval Research and the Army's research office at Frankfurt, Germany.

Because of its nonmilitary aspects the site chosen for the EO–ARDC was Brussels, Belgium. The purpose of the office, together with its method of operation, is to look for research capabilities unique in Europe which may have significance for the Air Force or other American governmental interests. The EO–ARDC operates through various U.S. embassies and contracts with either military or civil parties which may have particular research usefulness, including industrial, university, or institutional agencies.

Proposals for research are made to the EO–ARDC by those who are aware of the Air Force needs. When research programs result, reports of findings are made to the Air Force which pays for them at going European rates. Normally the findings are published by the Armed Services Technical Information Agency.

Proposals made to the EO–ARDC must be approved by Research and Development Command Headquarters and are financed by the particular Air Force department interested in the project.

Since the European office was set up it has let a total of more than 350 contracts involving sums in excess of $8 million. The average contract runs in the neighborhood of $23,000. During the first year of its operation the European office developed only 15 contracts. Today it receives more proposals than it can easily handle.

The cost of EO–ARDC itself is running slightly more than half a million dollars per year. It is staffed by 56 military and civilian personnel, including technical operators, procurement and resources specialists.

The office maintains close liaison with its Army and Navy counterparts in Europe and checks with each prior to entering into a research contract with any foreign agency or entity.

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